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Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

Michael L. ASMUSSEN

For: ADVANCED SET TOP TERMINAL HAVING A VIDEO CALL FEATURE

Enclosed are:

- ☐ Certificate of Mailing with Express Mail Mailing Label No.
- ☒ (42) Figs. 1-35 sheets of drawings.
- ☐ A certified copy of a application.
- ☒ Declaration ☐ Signed. ☒ Unsigned.
- ☐ Power of Attorney
- ☐ Information Disclosure Statement
- ☐ Preliminary Amendment
- ☐ Other:

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	105	- 20 =	85	x \$18.00	\$1,530.00
Indep. Claims	7	- 3 =	4	x \$78.00	\$312.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$690.00
TOTAL FILING FEE					\$2,532.00

- ☒ A check in the amount of \$2,532.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. 04-1425 as described below. A duplicate copy of this sheet is enclosed.
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Dated: 2000 June 30



Signature

Matthews Phillips, Reg. No. 43,403

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ADVANCED SET TOP TERMINAL HAVING A VIDEO CALL FEATURE

RELATED APPLICATIONS

The following applications and patents are incorporated herein by reference: U.S. Application Serial Number 09/528,614, filed March 9, 2000, entitled, ADVANCED SET TOP TERMINAL HAVING A PROGRAM PAUSE FEATURE; U.S. Application Serial Number 08/868,967, filed June 5, 1997, entitled CALLER IDENTIFICATION SYSTEM FOR TELEVISION; U.S. Patent No. 5,990,927, dated November 23, 1999, entitled ADVANCED SET TOP FOR CABLE TELEVISION DELIVERY SYSTEM; U.S. Application Serial No. 08/928,630, filed September 12, 1997, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS; U.S. Application Serial No. 09/404,707, filed September 15, 1999, entitled PROGRAM DELIVERY SYSTEM FOR NVOD; U.S. Patent No. 5,798,785, dated August 25, 1998, entitled TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM; U.S. Patent No. 5,600,364, dated February 4, 1997, entitled NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS; U.S. Patent No. 5,659,350, dated August 19, 1997, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM; U.S. Patent No. 5,834,853, dated March 31, 1998, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS; U.S. Patent No. 5,682,195, dated October 28, 1997, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM; and U.S. Application Serial No. 09/391,461, filed September 9, 1999, entitled VIDEO CONFERENCING USING AN ELECTRONIC BOOK VIEWER.

TECHNICAL FIELD

The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to an apparatus and

1 method for pausing of a video program based upon automatic detection of occurrence of a
2 communications event.

3 BACKGROUND

4 Advances in television entertainment have been primarily driven by breakthroughs in
5 technology. In 1939, advances on Vladimir Zworykin's picture tube provided the stimulus for
6 NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided
7 consumers with increased programming to homes.

8 Many of these technology breakthroughs have produced inconvenient systems for
9 consumers. One example is the ubiquitous three remote control home, having a separate and
10 unique remote control for the TV, cable box and VCR. More recently, technology has
11 provided cable users in certain parts of the country with 100 channels of programming. This
12 increased program capacity is beyond the ability of many consumers to use effectively. No
13 method of managing the program choices has been provided to consumers.

14 Consumers are demanding that future advances in television entertainment, particularly
15 programs and program choices, be presented to the consumer in a user friendly manner.
16 Consumer preferences, instead of technological breakthroughs, will drive the television
17 entertainment market for at least the next 20 years. As computer vendors have experienced
18 a switch from marketing new technology in computer hardware to marketing better useability,
19 interfaces and service, the television entertainment industry will also experience a switch from
20 new technology driving the market to consumer useability driving the market.

21 Consumers want products incorporating new technology that are useful, and will no
22 longer purchase new technology for the sake of novelty or status. Technological advances in
23 sophisticated hardware are beginning to surpass the capability of the average consumer to use
24 the new technology. Careful engineering must be done to make entertainment products
25 incorporating new technology useful and desired by consumers.

1 In order for new television entertainment products to be successful, the products must
2 satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety
3 of choices, from no control of programming to complete control. Consumers wish to advance
4 from cumbersome and inconvenient television to easy and convenient television and keep costs
5 down. Consumers do not wish to pay for one hundred channels when due to lack of
6 programming information, they seldom, if ever, watch programming on many of these channels.

7 The concepts of interactive television, high definition television and 300 channel cable
8 systems in consumer homes will not sell if they are not packaged, delivered and presented in
9 a useable fashion to consumers. The problem is that TV programming is not being delivered
10 and presented to consumers in a user friendly manner.

11 Consumers are already being bombarded with programming options, numerous "free"
12 cable channels, subscription cable channels and pay-per-view choices. Any further increase
13 in TV entertainment choices, without a user friendly presentation and approach, will likely
14 bewilder viewers with a mind-numbing array of choices.

15 The TV industry has traditionally marketed and sold its programs to consumers in bulk,
16 such as continuous feed broadcast and long-term subscriptions to movie channels. The TV
17 industry is unable to sell its programming in large quantities on a unit per unit basis, such as the
18 ordering of one program. Consumers prefer a unit sales approach because it keeps costs
19 down and allows the consumer to be more selective in their viewing.

20 In addition, viewership fragmentation, which has already begun, will increase.
21 Programming not presented in a user friendly manner will suffer with a decrease in viewership
22 and revenue. As programming presentation becomes more user friendly, users seek additional
23 features and functional capabilities.

24 What is needed is a system which can deliver and present television programming
25 through a user friendly interface which allows the consumer to easily select from among the
26 many program choices.

1 What is needed is a set top converter that provides a user friendly interface for
2 subscribers to access television programs.

3 What is needed is a set top converter with enhanced functionality.

4 What is needed is a set top converter that provides users with advanced features and
5 capabilities.

6 What is needed is a method that allows efficient access to hundreds of television
7 programming options.

8 What is needed is technology that upgrades the functionality of existing set top
9 converters.

10 What is needed is hardware that provides an upgrade capability allowing the use of
11 existing set top converter technology in advanced program delivery systems.

12 What is needed is a set top converter that provides an upstream communications
13 capability between the set top converter and cable headend.

14 What is needed is a set top converter that provides a capability of generating menus
15 for display.

16 What is needed is a set top converter that provides a simple way to select a program
17 from a menu.

18 What is needed is a set top converter that allows users to subscribe on-screen to
19 specialty channels.

20 What is needed is a set top converter that monitors subscriber viewing choices for
21 statistical purposes.

22 What is needed is a set top converter that provides sophisticated on-screen television
23 menus which can incorporate still video and moving video.

24 What is needed is a set top converter that provides a capability of scaling and
25 redirecting video for menus.

26 The present invention is addressed to fulfill these needs.

1 SUMMARY

2 The present invention is a set top converter box or terminal for a television program
3 delivery system. More specifically, the present invention is an advanced set top converter box
4 that acts as a terminal in the viewer's home. The set top terminal is a key component of a
5 digital cable television delivery system. The set top terminal is an upgradeable system that
6 provides for the decompression of digital program signals. The preferred set top terminal
7 provides both a menu generation capability as well as a number of advanced features and
8 functional capabilities.

9 The set top terminal of the present invention may be achieved through a set of hardware
10 upgrades to any of the following embodiments: (1) an existing set top converter upgraded with
11 a circuit card (which has a microprocessor electronically connected to the set top converter);
12 (2) an industry standard decompression converter upgradeable by either an upgrade module
13 or a menu generation card; and (3) a set top converter box capable of both decompression and
14 menu generation. The hardware upgrades provide additional advanced features and functional
15 capabilities to any of these embodiments.

16 A number of advanced features and functional capabilities are supported by the
17 preferred set top terminal. This set top terminal provides subscribers with a picture-on-picture
18 capability without requiring a special television to support the capability. The set top terminal
19 also supports a TV guide service, which provides subscribers with information on all
20 programming available at its particular subscriber location. The set top terminal further includes
21 the capability of querying viewers to establish, among other things, favorite channel lists,
22 personal profile data and mood information. The set top terminal allows the subscriber to view
23 promotional menus on future programming events.

24 The set top terminal supports additional capabilities using its hardware upgrades that
25 allow subscribers to use other interactive services, for example, to engage in on-line question
26 and answer sessions, to order and confirm airline tickets, and to access a variety of other data

1 services. The set top terminal makes use of a digital tuner as a hardware upgrade to provide
2 subscribers with a digital audio capability.

3 The preferred set top terminal may be used to control video tape machines, thereby
4 simplifying the recording of programs. The set top terminal can, in conjunction with the
5 program delivery system, easily support high definition television (HDTV). For subscribers
6 living in remote locations, the set top terminal accommodates backyard satellite systems. In
7 addition to all the features that the set top terminal supports with its current internal
8 programming and upgradeability, additional features may be added or existing features
9 increased through remote reprogramming of the set top terminal 220 or other programming.

10 Such features include the capability to send and receive video calls through the set top
11 terminal equipped with a camera and microphone. The video call can be communicated
12 through the cable television delivery system or other communications networks.

13 Other such features include a system for automatically pausing a video program in
14 response to detection of the occurrence of a video call event or triggering event. In response
15 to an incoming video phone call, message, web page, or other video information, the system
16 pauses the video program and displays an indication of the occurrence of the video call event.
17 Alternatively, the system pauses the video program in response to a triggering event, which
18 includes a user's access to a video call event. The system also buffers the video program while
19 paused, permitting a user to replay missed portions of it. As used herein, "video programs"
20 include live or prerecorded programs from any source such as, for example, a broadcast
21 television signal transmission, a cable television signal transmission, satellite television, video
22 streaming over the Internet or other network, a VCR, a computer memory such as a hard disk,
23 CD-ROM, or digital versatile disk (DVD).

24 Still other such features include caller identification of video calls and dual display of
25 video programs and video calls, such as picture in picture. The video call functionality can be
26 built into a set top terminal or provided as a hardware upgrade to a set top terminal.

1 It is an object of the invention to provide a user friendly interface for subscribers to
2 access television programs.

3 It is an object of the invention to allow users to easily navigate through hundreds of
4 programming choices using on-screen menus.

5 It is an object of this invention to efficiently access hundreds of television programming
6 options.

7 It is an object of this invention to upgrade the functionality of existing set top converters.

8 It is an object of this invention to provide an upgrade capability allowing the use of
9 existing set top converter technology in an advanced program delivery system.

10 It is an object of this invention to provide an upstream communications capability
11 between the set top converter and cable headend.

12 It is an object of this invention to provide a set top terminal capable of generating
13 menus for display.

14 It is an object of this invention to allow users to subscribe on-screen to specialty
15 channels.

16 It is an object of this invention to monitor subscriber viewing choices for statistical
17 purposes.

18 It is an object of this invention to provide sophisticated on-screen television menus
19 which can incorporate still video and moving video.

20 These and other objects and advantages of the invention will become obvious to those
21 skilled in the art upon review of the following description, the attached drawings and appended
22 claims.

23 DESCRIPTION OF THE DRAWINGS

24 Figure 1 is a diagram of the primary components of the television delivery system.

25 Figure 2 is an overview of the television delivery system operations.

26 Figure 3 is a schematic of the operation of the primary components of the system.

1 Figure 4 is a block diagram of the hardware components of the set top terminal.
2 Figure 5a is a perspective front view of a set top terminal.
3 Figure 5b is a perspective rear view of a set top terminal.
4 Figure 6 is a schematic of a Turbo card upgrade for a set top terminal.
5 Figure 7a is a drawing of a frame format for program control information signal.
6 Figure 7b is a drawing of a frame format for a polling response from the set top
7 terminal.
8 Figure 8 is a drawing of the basic menus used in the present invention, including the ten
9 major menus represented by icons.
10 Figure 9a is a schematic of a basic decompression box with upgrade module and
11 associated connections.
12 Figure 9b is a schematic of an alternative embodiment of a simple decompression box
13 with upgrade module and associated connections.
14 Figure 10 is a more detailed block diagram of the components of a simple
15 decompression box with upgrade module.
16 Figure 11 is a schematic of the set top terminal's upstream data transmission hardware.
17 Figure 12a is a schematic showing the components of the Level A, B, and C hardware
18 upgrades.
19 Figure 12b is a schematic showing the components of the Level D hardware upgrade.
20 Figure 13a is a schematic showing the two parts of a remote control unit.
21 Figure 13b is a drawing of the preferred remote control unit.
22 Figure 14 is a diagram of the components of a set top terminal having a picture-on-
23 picture capability.
24 Figure 15 is a drawing of a menu related to program catalogue services.
25 Figures 16a through 16d are drawings of viewer querying and mood question menus.
26 Figures 17a and 17b are drawings of the set top terminal hardware components that
27 accommodate transparent channel switching.

1 Figure 18 is a drawing of an interactive television promotional menu for a set top
2 terminal hardware upgrade.

3 Figures 19a and 19b are drawings of submenus for interactive television services using
4 hardware upgrade Level A.

5 Figures 20a through 20d are drawings of interactive services using hardware upgrade
6 Level B, which are related to on-screen airline reservations.

7 Figure 21 is a drawing of a menu for digital audio services.

8 Figure 22 is a drawing of a menu related to program guide services.

9 Figure 23 is a drawing of a menu related to high definition television (HDTV)
10 programming.

11 Figures 24a-24d are diagrams of exemplary indications of particular communications
12 events for use in pausing a video program.

13 Figure 25 is a diagram illustrating use of a buffer to store a video program while it is
14 paused in response to detection of occurrence of a communications event.

15 Figure 26 is a diagram of use of a buffer to permit the user to execute various video
16 program control functions of a buffered video program.

17 Figure 27 is a flow chart of a method for programming a caller ID function.

18 Figure 28 is a flow chart of a method for event monitoring for use in pausing a video
19 program in response to detection of occurrence of a communications event.

20 Figure 29 is a flow chart of a method for video program control of a buffered video
21 program.

22 Figure 30 is a block diagram of a set top terminal with video calling capabilities.

23 Figure 31 is a diagram of various video conferencing network connections according
24 to a preferred embodiment of the present invention.

25 Figure 32 is a diagram of a mini-network without a central node, according to a
26 preferred embodiment of the present invention.

Figure 33 is a diagram of a mini-network having a central node, according to a preferred embodiment of the present invention.

Figure 34 is a connection diagram of a conference call among the three set top terminals.

Figure 35 is a block diagram of a video conferencing central node.

DETAILED DESCRIPTION

A. Television Program Delivery System Description

1. Introduction

Figure 1 shows the present invention as part of an expanded cable television program delivery system 200 that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media. The program delivery system 200 shown provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of a single button, the subscriber can advance from one menu to the next. In this fashion, the subscriber can sequence the menus and select a program from any given menu. The programs are grouped by category so that similar program offerings are found on the same menu.

2. Major System Components

1 In its most basic form, the system uses a program delivery system 200 in conjunction
2 with a conventional concatenated cable television system 210. The program delivery system
3 200 generally includes (i) at least one operations center 202, where program packaging and
4 control information are created and then assembled in the form of digital data, (ii) a digital
5 compression system, where the digital data is compressed, combined/multiplexed, encoded,
6 and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a
7 set of in-home decompressors. The program delivery system 200 transports the digital signals
8 to the cable headend 208 where the signals are transmitted through a concatenated cable
9 television system 210. Within the cable headend 208, the received signals may be decoded,
10 demultiplexed, managed by a local central distribution and switching mechanism, combined and
11 then transmitted to the set top terminal 220 located in each subscriber's home over the cable
12 system 210. Although concatenated cable systems 210 are the most prevalent transmission
13 media to the home, telephone lines, cellular networks, fiberoptics, Personal Communication
14 Networks and similar technology for transmitting to the home can be used interchangeably with
15 this program delivery system 200.

16 The delivery system 200 has a reception region 207 with an in-home decompression
17 capability. This capability is performed by a decompressor housed within a set top terminal
18 220 in each subscriber's home. The decompressor remains transparent from the subscriber's
19 point of view and allows any of the compressed signals to be demultiplexed and individually
20 extracted from the composite data stream and then individually decompressed upon selection
21 by the subscriber. The decompressed video signals are converted into analog signals for
22 television display. Such analog signals include NTSC formatted signals for use by a standard
23 television. Control signals are likewise extracted and decompressed and then either executed
24 immediately or placed in local storage such as a RAM. Multiple sets of decompression
25 hardware may be used to decompress video and control signals. The set top terminal 220 may
26 then overlay or combine different signals to form the desired display on the subscriber's
27 television. Graphics on video or picture-on-picture are examples of such a display.

1 Although a single digital compression standard (e.g., MPEG) may be used for both the
2 program delivery system 200 and the concatenated cable system 210, the compression
3 technique used may differ between the two systems. When the compression standards differ
4 between the two media, the signals received by the cable headend 208 must be decompressed
5 before transmission from the headend 208 to the set top terminals 220. Subsequently, the
6 cable headend 208 must recompress and transmit the signals to the set top terminal 220, which
7 would then decompress the signals using a specific decompression algorithm.

8 The video signals and program control signals received by the set top terminal 220
9 correspond to specific television programs and menu selections that each subscriber may
10 access through a subscriber interface. The subscriber interface is a device with buttons located
11 on the set top terminal 220 or on a portable remote control 900. In the preferred system
12 embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote
13 control device 900, which provides direct or menu-driven program access. The preferred
14 subscriber interface also contains cursor movement and go buttons as well as alpha, numeric
15 and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to
16 sequence through menus by choosing from among several menu options that are displayed on
17 the television screen. In addition, a user may bypass several menu screens and immediately
18 choose a program by selecting the appropriate alpha-character, numeric or iconic combinations
19 on the subscriber interface. In the preferred embodiment, the set top terminal 220 generates
20 the menus that are displayed on the television by creating arrays of particular menu templates,
21 and the set top terminal 220 displays a specific menu or submenu option for each available
22 video signal.

23 3. Operations Center and Digital Compression System

24 The operations center 202 performs two primary services, packaging television
25 programs and generating the program control information signal. At the operations center 202,
26 television programs are received from external program sources in both analog and digital form.

1 Figure 2 shows an embodiment of the operations center receiving signals from various external
2 sources 212. Examples of the external program sources are sporting events, children's
3 programs, specialty channels, news or any other program source that can provide audio or
4 visual signals. Once the programs are received from the external program sources, the
5 operations center 202 digitizes (and preferably compresses) any program signals received in
6 analog form. The operations center 202 may also maintain an internal storage of programs.
7 The internally stored programs may be in analog or digital form and stored on permanent or
8 volatile memory sources, including magnetic tape or RAM. Subsequent to receiving
9 programming, the operations center 202 packages the programs into the groups and categories
10 which provide the optimal marketing of the programs to subscribers. For example, the
11 operations center 202 may package the same programs into different categories and menus for
12 weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202
13 packages the television programs in a manner that enables both the various menus to easily
14 represent the programs and the subscribers to easily access the programs through the menus.

15 The packaging of the digital signals is typically performed at the operations center 202
16 by computer assisted packaging equipment (CAP). The CAP system normally includes at least
17 one computer monitor, keyboard, mouse, and standard video editing equipment. A
18 programmer packages the signals by entering certain information into the CAP. This
19 information includes the date, time slot, and program category of the various programs. The
20 programmer and the CAP utilize demographic data and ratings in performing the packaging
21 tasks. After the programmer selects the various programs from a pool of available programs
22 and inputs the requisite information, the programmer, with assistance from the CAP, can select
23 the price and allocate transponder space for the various programs. After the process is
24 complete, the CAP displays draft menus or program schedules that correspond to the entries
25 of the programmer. The CAP may also graphically display allocation of transponder space.
26 The programmer may edit the menus and transponder allocation several times until satisfied with

1 the programming schedule. During the editing, the programmer may direct the exact location
2 of any program name on a menu with simple commands to the CAP.

3 The packaging process also accounts for any groupings by satellite transponder which
4 are necessary. The operations center 202 may send different groups of programs to different
5 cable headends 208 and/or set top terminals 220. One way the operations center 202 may
6 accomplish this task is to send different program packages to each transponder. Each
7 transponder, or set of transponders, then relays a specific program package to specific cable
8 headends 208 and/or set top terminals 220. The allocation of transponder space is an
9 important task performed by the operations center 202.

10 The operations center 202 may also "insert" directions for filling local available program
11 time in the packaged signal to enable local cable and television companies to fill the program
12 time with local advertising and/or local programming. Consequently, the local cable headends
13 208 are not constrained to show only programs transmitted from the operations center 202.
14 New set top converters will incorporate both digital and analog channels. Therefore, the cable
15 headend 208 may combine analog signals with the digital signals prior to transmitting the
16 program signals to the set top terminals 220.

17 After the CAP packages the programs, it creates a program control information signal
18 to be delivered with the program package to the cable headend 208 and/or set top terminal
19 220. The program control information signal contains a description of the contents of the
20 program package, commands to be sent to the cable headend 208 and/or set top terminal 220,
21 and other information relevant to the signal transmission.

22 In addition to packaging the signal, the operations center 202 employs digital
23 compression techniques to increase existing satellite transponder capacity by at least a 4:1 ratio,
24 resulting in a four-fold increase in program delivery capability. A number of digital compression
25 algorithms currently exist which can achieve the resultant increase in capacity and improved
26 signal quality desired for the system. The algorithms generally use one or more of three basic
27 digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame

1 (interframe) compression, and (3) within carrier compression. Specifically, in the preferred
2 embodiment, the MPEG 2 compression method is used. After digital compression, the signals
3 are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to
4 various uplink sites 204.

5 There may be a single uplink site 204 or multiple uplink sites (represented by 204',
6 shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either
7 be located in the same geographical place or may be located remotely from the operations
8 center 202. Once the composite signal is transmitted to the uplink sites 204, the signal may be
9 multiplexed with other signals, modulated, upconverted and amplified for transmission over
10 satellite. Multiple cable headends 208 may receive such transmissions.

11 In addition to multiple uplinks, the delivery system 200 may also contain multiple
12 operations centers. The preferred method for using multiple operations centers is to designate
13 one of the operations centers as a master operations center and to designate the remaining
14 operations centers as slave operations centers. In this configuration, the master operations
15 center coordinates various functions among the slave operations centers such as synchronization
16 of simultaneous transmissions and distributes the operations workload efficiently.

17 4. Cable Headend

18 After the operations center 202 has compressed and encoded the program signals and
19 transmitted the signals to the satellite, the cable headend 208 receives and further processes
20 the signals before they are relayed to each set top terminal 220. Each cable headend site is
21 generally equipped with multiple satellite receiver dishes. Each dish is capable of handling
22 multiple transponder signals from a single satellite and sometimes from multiple satellites.

23 As an intermediary between the set top terminals 220 and the operations center 202
24 (or other remote site), the cable headend 208 performs two primary functions. First, the cable
25 headend 208 acts as a distribution center, or signal processor, by relaying the program signal
26 to the set top terminal 220 in each subscriber's home. In addition, the cable headend 208 acts

1 as a network controller 214 by receiving information from each set top terminal 220 and
2 passing such information on to an information gathering site such as the operations center 202.

3 Figure 3 shows an embodiment where the cable headend 208 and the subscriber's
4 home are linked by certain communications media 216. In this particular embodiment, analog
5 signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are
6 sent and received over the media 216. The cable headend 208 provides such signaling
7 capabilities in its dual roles as a signal processor 209 and network controller 214.

8 As a signal processor 209, the cable headend 208 prepares the program signals that
9 are received by the cable headend 208 for transmission to each set top terminal 220. In the
10 preferred system, the signal processor 209 re-routes or demultiplexes and recombines the
11 signals and digital information received from the operations center 202 and allocates different
12 portions of the signal to different frequency ranges. Cable headends 208 which offer different
13 subscribers different program offerings may allocate the program signals from the operations
14 center 202 in various manners to accommodate different viewers. The signal processor 209
15 may also incorporate local programming and/or local advertisements into the program signal
16 and forward the revised signal to the set top terminals 220. To accommodate this local
17 programming availability, the signal processor 209 must combine the local signal in digital or
18 analog form with the operations center program signals. If the local cable system uses a
19 compression standard that is different than the one used by the operations center 202, the signal
20 processor 209 must also decompress and recompress incoming signals so they may be
21 properly formatted for transmission to the set top terminals 220. This process becomes less
22 important as standards develop (i.e., MPEG 2). In addition, the signal processor 209 performs
23 any necessary signal decryption and/or encryption.

24 As a network controller 214, the cable headend 208 performs the system control
25 functions for the system. The primary function of the network controller 214 is to manage the
26 configuration of the set top terminals 220 and process signals received from the set top
27 terminals 220. In the preferred embodiment, the network controller 214 monitors, among other

1 things, automatic poll-back responses from the set top terminals 220 remotely located at each
2 subscribers' home. The polling and automatic report-back cycle occurs frequently enough to
3 allow the network controller 214 to maintain accurate account and billing information as well
4 as monitor authorized channel access. In the simplest embodiment, information to be sent to
5 the network controller 214 will be stored in RAM within each subscriber's set top terminal 220
6 and will be retrieved only upon polling by the network controller 214. Retrieval may, for
7 example, occur on a daily, weekly or monthly basis. The network controller 214 allows the
8 system to maintain complete information on all programs watched using a particular set top
9 terminal 220.

10 The network controller 214 is also able to respond to the immediate needs of a set top
11 terminal 220 by modifying a program control information signal received from the operations
12 center 202. Therefore, the network controller 214 enables the delivery system to adapt to the
13 specific requirements of individual set top terminals 220 when the requirements cannot be
14 provided to the operations center 202 in advance. In other words, the network controller 214
15 is able to perform "on the fly programming" changes. With this capability, the network
16 controller 214 can handle sophisticated local programming needs such as, for example,
17 interactive television services, split screen video, and selection of different foreign languages for
18 the same video. In addition, the network controller 214 controls and monitors all compressors
19 and decompressors in the system.

20 The delivery system 200 and digital compression of the preferred embodiment provides
21 a one-way path from the operations center 202 to the cable headend 208. Status and billing
22 information is sent from the set top terminal 220 to the network controller 214 at the cable
23 headend 208 and not directly to the operations center 202. Thus, program monitoring and
24 selection control will take place only at the cable headend 208 by the local cable company and
25 its decentralized network controllers 214 (i.e., decentralized relative to the operations center
26 202, which is central to the program delivery system 200). The local cable company will in turn
27 be in communication with the operations center 202 or a regional control center (not shown)

1 which accumulates return data from the set top terminal 220 for statistical or billing purposes.
2 In alternative system embodiments, the operations center 202 and the statistical and billing sites
3 are collocated. Further, telephone lines with modems are used to transfer information from the
4 set top terminal 220 to the statistical and billing sites.

5 5. Set Top Terminal

6 The set top terminal 220 is the portion of the delivery system 200 that resides in the
7 home of a subscriber. The set top terminal 220 is usually located above or below the
8 subscriber's television, but it may be placed anywhere in or near the subscriber's home as long
9 as it is within the range of the subscriber's remote control device 900. In some aspects, the set
10 top terminal 220 may resemble converter boxes already used by many cable systems. For
11 instance, each set top terminal 220 may include a variety of error detection, decryption, and
12 coding techniques such as anti-taping encoding. However, it will become apparent from the
13 discussion below that the set top terminal 220 is able to perform many functions that an
14 ordinary converter box cannot perform.

15 The set top terminal 220 has a plurality of input and output ports to enable it to
16 communicate with other local and remote devices. The set top terminal 220 has an input port
17 that receives information from the cable headend 208. In addition, the unit has at least two
18 output ports which provide communications from the set top terminal 220 to a television and
19 a VCR. Certain menu selections may cause the set top terminal 220 to send control signals
20 directly to the VCR to automatically program or operate the VCR. Also, the set top terminal
21 220 contains a phone jack which can be used for maintenance, trouble shooting,
22 reprogramming and additional customer features. The set top terminal 220 may also contain
23 stereo/audio output terminals, a satellite dish input port and/or microphone and camera input
24 ports for supporting video calls.

25 Functionally, the set top terminal 220 is the last component in the delivery system chain.
26 The set top terminal 220 receives compressed program and control signals from the cable
27 headend 208 (or, in some cases, directly from the operations center 202). After the set top

1 terminal 220 receives the individually compressed program and control signals, the signals are
2 demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in
3 local storage (from which the menu template may be created), executed immediately, or sent
4 directly to the television screen.

5 After processing certain signals received from the cable headend 208, the set top
6 terminal 220 is able to store menu templates for creating menus that are displayed on a
7 subscriber's television by using an array of menu templates. Before a menu can be constructed,
8 menu templates must be created and sent to the set top terminal 220 for storage. A
9 microprocessor uses the control signals received from the operations center 202 or cable
10 headend 208 to generate the menu templates for storage. Each menu template may be stored
11 in volatile memory in the set top terminal 220. When the set top terminal receives template
12 information it demultiplexes the program control signals received from the cable headend 208
13 into four primary parts: video, graphics, program logic and text. Each menu template
14 represents a different portion of a whole menu, such as a menu background, television logo,
15 cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu
16 templates may be deleted or altered using control signals received from the operations center
17 202 or cable headend 208.

18 Once the menu templates have been stored in memory, the set top terminal 220 can
19 generate the appropriate menus. In the preferred embodiment, the basic menu format
20 information is stored in memory located within the set top terminal 220 so that the
21 microprocessor may locally access the information from the set top terminal instead of from an
22 incoming signal. The microprocessor next generates the appropriate menus from the menu
23 templates and the other menu information stored in memory. The set top terminal 220 then
24 displays specific menus on the subscriber's television screen that correspond to the inputs the
25 subscriber selects.

26 If the subscriber selects a specific program from a menu, the set top terminal 220
27 determines on which channel the program is being shown, demultiplexes and extracts the single

1 channel transmitted from the cable headend 208. The set top terminal 220 then decompresses
2 the channel and, if necessary, converts the program signal to an analog NTSC signal to enable
3 the subscriber to view the selected program. The set top terminal 220 can be equipped to
4 decompress more than one program signal, but this would unnecessarily add to the cost of the
5 unit since a subscriber will generally only view one program at a time. However, two or three
6 decompressors may be desirable to provide picture-on-picture capability, control signal
7 decompression, enhanced channel switching or like features.

8 In addition to menu information, the set top terminal 220 may also store text transmitted
9 from the cable headend 208 or the operations center 202. The text may inform the subscriber
10 about upcoming events, billing and account status, new subscriptions, or other relevant
11 information. The text will be stored in an appropriate memory location depending on the
12 frequency and the duration of the use of the textual message.

13 Also, optional upgrades are available to enhance the performance of a subscriber's set
14 top terminal 220. These upgrades may consist of a cartridge or computer card (not shown)
15 that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature
16 offered by the cable headend 208 or operations center 202 to which the user may subscribe.
17 Available upgrades may include on line data base services, interactive multi-media services,
18 access to digital radio channels, and other services.

19 In the simplest embodiment, available converter boxes such as those manufactured by
20 General Instruments or Scientific Atlanta, may be modified and upgraded to perform the
21 functions of a set top terminal 220. The preferred upgrade is a circuit card with a
22 microprocessor which is electronically connected to or inserted into the converter box.

23 6. Remote Control Device

24 The primary conduit for communication between the subscriber and the set top terminal
25 220 is through the subscriber interface, preferably a remote control device 900. Through this
26 interface, the subscriber may select desired programming through the system's menu-driven
27 scheme or by directly accessing a specific channel by entering the actual channel number.

1 Using the interface, the subscriber can navigate through a series of informative program
2 selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can
3 access desired programs by simply pressing a single button rather than recalling from memory
4 and pressing the actual channel number to make a selection. The subscriber can access regular
5 broadcast and basic cable television stations by using either the numeric keys on the remote
6 control 900 (pressing the corresponding channel number), or one of the menu icon selection
7 options.

8 In addition to enabling the subscriber to easily interact with the cable system 200, the
9 physical characteristics of the subscriber interface 900 should also add to the user friendliness
10 of the system. The remote control 900 should easily fit in the palm of the user's hand. The
11 buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable
12 by the subscriber. Also, buttons that perform similar functions may be color coordinated and
13 consist of distinguishing textures to increase the user friendliness of the system.

14 7. Menu-Driven Program Selection

15 The menu-driven scheme provides the subscriber with one-step access to all major
16 menus, ranging from hit movies to sport specials to specialty programs. From any of the major
17 menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-
18 character access.

19 There are two different types of menus utilized by the preferred embodiment, the
20 Program Selection menus and the During Program menus. The first series of menus, Program
21 Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The
22 second series of menus, During Program menus, consists of two primary types, Hidden menus
23 and the Program Overlay menus.

24 Immediately after the subscriber turns on the set top terminal 220, the Introductory
25 menu welcomes the subscriber to the system. The Introductory menu may display important
26 announcements from the local cable franchise, advertisements from the cable provider, or other

1 types of messages. In addition, the Introductory menu can inform the subscriber if the cable
2 headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

3 After the Introductory menu has been displayed the subscriber may advance to the next
4 level of menus, namely the Home menu. In the preferred embodiment, after a certain period
5 of time, the cable system will advance the subscriber by default to the Home menu. From the
6 Home menu, the subscriber is able to access all of the programming options. The subscriber
7 may either select a program directly by entering the appropriate channel number from the
8 remote control 900, or the subscriber may sequence through incremental levels of menu options
9 starting from the Home menu. The Home menu lists categories that correspond to the first level
10 of menus called Major menus.

11 If the subscriber chooses to sequence through subsequent menus, the subscriber will
12 be forwarded to the Major menu that corresponds to the chosen category from the Home
13 menu. The Major menus further refine a subscriber's search and help guide the subscriber to
14 the selection of his choice.

15 From the Major menus, the subscriber may access several submenus. From each
16 submenu, the subscriber may access other submenus until the subscriber finds a desired
17 television program. Similar to the Major menu, each successive level of Submenus further
18 refines the subscriber's search. The system also enables the subscriber to skip certain menus
19 or submenus and directly access a specific menu or television program by entering the
20 appropriate commands on the remote control 900.

21 The During program menus (including Hidden Menus and Program Overlay Menus)
22 are displayed by the set top terminal 220 only after the subscriber has selected a television
23 program. In order to avoid disturbing the subscriber, the set top terminal 220 does not display
24 the Hidden Menus until the subscriber selects the appropriate option to display a Hidden Menu.
25 The Hidden Menus contain options that are relevant to the program selected by the viewer.
26 For example, a Hidden Menu may contain options that enable a subscriber to enter an
27 interactive mode or escape from the selected program.

1 Program Overlay Menus are similar to Hidden Menus because they occur during a
2 program and are related to the program being viewed. However, the Program Overlay Menus
3 are displayed concurrently with the program selected by the subscriber. Most Program
4 Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the
5 selected program comfortably.

6 B. Detailed Set Top Terminal Description

7 The set top terminal 220 receives and manipulates signals from the cable headend 208.
8 The set top terminal 220 is equipped with local computer memory and the capability of
9 interpreting the digitally compressed signal to produce menus for the subscriber. The remote
10 control 900 communicates the subscriber's selections to the set top terminal 220. The
11 subscriber's selections are generally based upon menus or other prompts displayed on the
12 television screen.

13 It is preferred that the signal reaches the subscriber's home in a compressed format and
14 is decompressed prior to viewing. Included in the delivered program signal is information that
15 enables equipment at the subscriber's home to display menus for choosing particular programs.
16 Depending on the particular embodiment, the television program signal may arrive at the
17 subscriber's home through one or more connections such as coaxial cables, fiber cables,
18 twisted pairs, cellular telephone connections, or personal communications network (PCN)
19 hookups.

20 The program control information signal is generated by the operations center 202 and
21 provides the network controller 214 with data on the scheduling and description of programs.
22 In an alternate configuration, this data is sent directly to the set top terminal 220 for display to
23 the subscriber. In the preferred embodiment, the program control information signal is stored
24 and modified by the network controller 214 and sent to the set top terminal 220 in the form of
25 a set top terminal control information stream (STTCIS). The set top terminal 220 integrates
26 either the program control information signal or the STTCIS with data stored in the memory

1 of the set top terminal 220 to generate on-screen menus that assist the subscriber in choosing
2 programs for display.

3 The types of information that can be sent using the program control signal include:
4 number of program categories, names of program categories, what channels are assigned to
5 a specific category (such as specialty channels), names of channels, names of programs on each
6 channel, program start times, length of programs, description of programs, menu assignment
7 for each program, pricing, whether there is a sample video clip for advertisement for the
8 program, and any other program, menu or product information.

9 With a minimal amount of information being communicated to the set top terminal 220
10 on a regular basis, the set top terminal 220 is able to determine the proper menu location for
11 each program and the proper time and channel to activate for the subscriber after a menu
12 selection. The program control information signal and STTCIS can be formatted in a variety
13 of ways and the on-screen menus can be produced using many different methods. For
14 instance, if the program control information signal carries no menu format information, the menu
15 format for creating the menus can be fixed in ROM at the set top terminal 220. In the preferred
16 embodiment, the menu format information is stored at the set top terminal 220 in a temporary
17 memory device such as a RAM or EPROM. New menu format information is sent via the
18 program control information signal or the STTCIS to the set top terminals 200 whenever a
19 change to a menu format is desired.

20 In the simplest embodiment, the menu formats remain fixed and only the text changes.
21 In this way the program control information signal can be limited to primarily text and a text
22 generator can be employed in the set top terminal 220. Another simple embodiment uses a
23 separate channel full-time (large bandwidth) just for the menu information.

24 Live video signals may be used in windows of certain menus. These video signals can
25 be transmitted using the program control information signal or STTCIS, or can be taken off
26 channels being transmitted simultaneously with the menu display. Video for menus, promos or
27 demos may be sent to the set top terminal 220 in several formats, including (1) on a dedicated

1 channel, (2) on a regular program channel and scaled to size, or (3) along with the program
2 control information signal. However, in the preferred embodiment, a large number of short
3 promos or demo video is sent using a split screen technique on a dedicated channel. A multiple
4 window technique may be used with the menus to display a description of a program and one
5 or more video frames that assist the subscriber in selecting the program.

6 Figure 4 shows the basic hardware components of the set top terminal 220. The set
7 top terminal 220 has a tuner 603, digital demodulator 606, decryptor 600, and demultiplexers
8 609, 616 as well as audio equipment 612 and a remote control interface 626 for receiving and
9 processing signals from the remote control unit 900. An optional modem 627 allows
10 communication between a microprocessor 602 and the cable headend 208. An NTSC
11 encoder 625 provides a standard NTSC video output.

12 The microprocessor 602 is capable of executing program instructions stored in
13 memory. These instructions allow a user to access various menus by making selections on the
14 remote control 900. To support video calling, the instructions also enable the microprocessor
15 602 to process video signals from a camera, to process audio signals from a microphone and
16 to control a camera and microphone. The microprocessor 602 may be a single
17 microprocessor, as shown, or may be several microprocessors, such as a general
18 microprocessor, a camera microprocessor and a microphone processor.

19 The manner in which the video is decompressed and the menus are generated from the
20 program control information signal or STTCIS varies depending on the specific embodiment
21 of the invention. Video decompressors 618 and 622 may be used if the video is compressed.
22 The program control information signal may be demultiplexed into its component parts, and a
23 video decompressor 618, graphic decompressor, text generator and video combiner 624 may
24 be used to assist in creating the menus.

25 In addition to the menu format information that is stored in graphics memory, the set
26 top terminal 220 also stores data, tracking those programs that have been selected for viewing.
27 By gathering this data, the set top terminal 220 can maintain an accurate record of all programs

1 accessed/watched by storing the data in EEPROM or RAM. Subsequently, this data can be
2 transmitted to the cable headend 208, where it can be used in carrying out network control and
3 monitoring functions. Such data transmissions between the set top terminal 220 and cable
4 headend 208 can be accomplished, for example, through upstream transmission over the cable
5 network or over telephone lines through the use of telephone modems. Where upstream
6 transmission over the cable network is used, the set top terminals 220 can complete data
7 transmissions on a scheduled (e.g., using a polling response or status report to respond to
8 polling requests sent from the cable headend 208) or as-needed (e.g., using a random access
9 technique) basis.

10 Figure 5a shows the front panel of the set top terminal 220, which includes an infrared
11 sensor 630 and a series of LED displays 640. The LED displays 640 may indicate with an
12 icon or a letter (e.g. A-K) the major menu currently selected by the set top terminal 220 or the
13 channels selected directly by a user, or menu channel selections (e.g., from 1 to 50). Further
14 displays may include current channel, time, volume level, sleep time, parental lock (security),
15 account balance, use of a hardware upgrade, second channel being recorded by VCR, use of
16 the Level D music hardware upgrade in a separate room, and any other displays useful to a
17 subscriber to indicate the current status of the set top terminal 220. The LEDs 640 may also
18 provide an indication of the digital audio channel currently tuned.

19 The set top terminal 220 includes a flapped opening 635 on its front that allows the
20 insertion of a magnetic cartridge (or similar portable storage device, including optical disk,
21 ROM, EPROM, etc. not shown). This cartridge opening 635 allows the set top terminal 220
22 to be upgraded or reprogrammed locally with the use of a magnetic tape cartridge.

23 On the top or cover of the set top terminal 220 are located pushbutton controls 645.
24 Any function that can be performed on the remote 900 may also be performed at the set top
25 terminal 220 using the duplicative pushbutton controls 645.

26 Figure 5b shows the back of the set top terminal 220, which includes a pair of output
27 terminals 650, pair of input terminals 652, pair of stereo/audio output terminals 654, satellite

1 dish input port 656, telephone jack 658 and an RS-232 or RS-422 port 660. In addition, an
2 upgrade port 662 and a cover plate 664 are held in place by a series of sheet metal screws.
3 One of the output terminals 650 is for a television and the other is for a VCR. The set top
4 terminal 220 is equipped to handle incoming signals on one or two cables using the input
5 terminals 652. The phone jack 658 and an RS-232 or RS-422 port 660 are provided for
6 maintenance, trouble shooting, reprogramming and additional customer features. In alternate
7 embodiments, the telephone jack 658 may be used as the primary mode of communication
8 between the cable headend 208 and the set top terminal 220. This connection is possible
9 through the local telephone, cellular telephone or a personal communications network (PCN).

10 Additionally, the set top terminal 220 includes a camera input 666 and a microphone
11 jack 667, by which a camera and microphone, respectively, can be connected. Alternatively,
12 a camera and microphone can be built into the set top terminal 220.

13 The basic programming of each set top terminal 220 is located on ROM within the set
14 top terminal 220. Random access memory, the magnetic cartridge capability, and the
15 expansion card slot 635 each allow upgrades and changes to be easily made to the set top
16 terminal 220.

17 In the preferred embodiment, the set top terminal 220 includes a hardware upgrade
18 port 662, in addition to expansion card slots. The hardware upgrade port 662 accommodates
19 a four-wire (or more) connection for: (1) error corrected, decrypted data output of the set top
20 terminal 220, (2) a control interface, (3) decompressed video output, and (4) a video input
21 port. In the preferred embodiment, multiple wires are used to perform each of the four
22 functions. The four sets of wires are combined in a single cable with a single multipin
23 connector.

24 In the preferred embodiment, multipin connections may be used for the multiwire cable.
25 The multipin connection 662 may range from DB9 to DB25. A variety of small computer
26 systems interface (SCSI) ports may also be provided. Alternatively, four or more ports may
27 be provided instead of the single port depicted.

1 Another port 662 is used to attach the various hardware upgrades described below to
2 a set top terminal 220. The preferred embodiment has a number of hardware upgrades
3 available for use with a set top terminal 220, including: (1) a Level A interactive unit, (2) a
4 Level B interactive unit, (3) a Level C interactive unit with compact disc capability, (4) a Level
5 D digital radio tuner for separate room use, and (5) a Level E information download unit. Each
6 of these upgrades may be connected to the set top terminal 220 unit through the upgrade port
7 662 described earlier. The same four wires in a single cable described earlier may be used.

8 Existing set top converter boxes such as those made by Scientific Atlanta or General
9 Instruments are presently unequipped to handle the menu selection system of the present
10 invention. Thus, hardware modifications are necessary in order to use the menu selection
11 system with existing set top converter technology.

12 A Turbo Card addition to a set top converter is depicted in Figure 6. The Turbo Card
13 700 shown provides the additional functionality needed to utilize the menu system with existing
14 set top converter technology. The primary functions the Turbo Card 700 adds to the set top
15 converter are the interpreting of program control information signals, generating of menus,
16 sequencing of menus, and, ultimately, the ability of the viewer to select a channel through the
17 menu system without entering any channel identifying information. The turbo card also provides
18 a method for a remote location, such as the cable headend 208, to receive information on
19 programs watched and control the operation of the set top converter and Turbo Card 700.
20 The programs watched information and control commands may be passed from the cable
21 headend 208 to the Turbo Card 700 using telephone lines.

22 Optionally, the Turbo Card 700 provides functionality to perform video calls using the
23 set top terminal 220. In this case, the Turbo Card 700 includes a camera interface 718 and
24 a microphone interface 719.

25 The primary components of the Turbo Card 700 are a PC chip CPU 702, a VGA
26 graphic controller 704, a video combiner 706, logic circuitry 708, NTSC encoder 710, a
27 receiver 712, demodulator 714, and a dialer 716. The Turbo Card 700 operates by receiving

1 the program control information signal from the cable headend 208 through the coaxial cable.
2 The logic circuitry 708 of the Turbo Card 700 receives data, infrared commands, and
3 synchronization signals from the set top converter. Menu selections made by the viewer on the
4 remote control 900 are received by the set top converter's IR equipment and passed through
5 to the Turbo Card 700. The Turbo Card 700 interprets the IR signal and determines the
6 program (or menu) the viewer has selected. The Turbo Card 700 modifies the IR command
7 to send the program selection information to the set top converter 221. The modified IR
8 command contains the channel information needed by the set top converter. Using the phone
9 line and dialer 716, the Turbo Card 700 is able to transmit program access information to the
10 cable headend 208.

11 In the preferred embodiment, program access information, that is what programs the
12 viewer watched, is stored at each set top terminal 220 until it is polled by the network
13 controller 214 using a polling request message format as shown in Figure 7a. This frame format
14 920 consists of six fields, namely: (1) a leading flag 922 at the beginning of the message, (2)
15 an address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier
16 928 that includes a polling command/response (or P/F) bit 930, (5) an information field 932,
17 and (6) a trailing flag 934 at the end of the message. Figure 7b shows a response frame format
18 920' (similar to the frame format 920 end, therefore, commonly numbered with the frame
19 depicted in Figure 7a, but with the prime indicator added for clarity) for information
20 communicated by the set top terminal 220 to the network controller 214 in response to the
21 polling request of Figure 7a.

22 The eight-bit flag sequence 922 that appears at the beginning and end of a frame is
23 used to establish and maintain synchronization. Such a sequence typically consists of a
24 "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set top
25 terminal 220. The subscriber region designation 926 is a 4-bit field that indicates the
26 geographical region in which the subscriber's set top terminal 220 is housed. The set top
27 terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a

1 15-bit designation followed by an appended P/F bit 930. Although field size is provided by
2 this example, a variety of sizes can be used with the present invention.

3 The P/F bit 930 is used to command a polling response from the set top terminal 220
4 addressed, as described below. The response frame format 920' also provides a variable-
5 length information field 932' for other data transmissions, such as information on system
6 updates. The frame format 920' ends with an 8-bit flag (or trailing flag) 934' that is identical
7 in format to the leading flag 922', as set forth above. Other frame formats (e.g., MPEG) will
8 be apparent to one skilled in the art and can be easily adapted for use with the system.

9 As summarized above, images or programs may be selected for display by sequencing
10 through a series of menus. Figure 8 is an example of one possible structure for a series of
11 menus. Generally, the sequence of menus is structured with an introductory menu, a home
12 menu, various major menus and a multitude of submenus. The submenus can include promo
13 menus and during program menus. For example, at the home menu portion of the sequence
14 of menus and corresponding software routines, a subscriber may select one of the major menus
15 and start a sequence of menu displays. Alternatively, a subscriber may go directly to a major
16 menu by depressing a menu select button on remote control 900.

17 At any time during the menu sequence, the subscriber may depress a major menu
18 button to move into another series of menus. In this way, a subscriber may move from major
19 menu to major menu.

20 The various software subroutines executed by the microprocessor 602 allow a
21 subscriber to sequence the menus, navigating through the various menus of the present
22 invention. A subscriber may sequence back through menus or return to the home menu with
23 a single touch of the home menu button on remote 900.

24 An introductory menu screen 1000 automatically appears upon power-up and
25 initialization of the set top terminal 220. From this introductory menu screen 1000, the set top
26 terminal software will normally advance the subscriber to the home menu screen 1010. The
27 home menu 1010 is the basic menu that the subscriber will return to in order to make the first

1 level of viewing decisions. When the set top terminal software is displaying the home menu
2 1010, the subscriber is able to access any television programming option. The software allows
3 programming options to be entered through cursor movement on the screen and directly by
4 button selection on the remote control 900.

5 In the normal progression through the menu screens, the software will forward the
6 subscriber to a major menu screen 1020 in response to the subscriber's remote control 900
7 selection or highlighted cursor selection from the home menu screen 1010. The selections
8 displayed on the home menu 1010 are for large categories of programming options.

9 Following the major menu 1020, the subscriber may navigate through one or more
10 submenu screens 1050 from which the subscriber may choose one particular program for
11 viewing. For most programming selections, the user will proceed from the home menu 1010
12 to a major menu 1020 and then to one or more submenus 1050. However, for certain
13 programming options or functions of the set top terminal 220, the user may skip one or more
14 menus in the sequence.

15 The During Program Menus 1200 are submenus enabled by the set top terminal
16 software only after the subscriber has selected a television program. These menus provide the
17 subscriber with additional functionality and/or additional information while viewing a selected
18 program. The During Program Menus 1200 sequence can be further subdivided into at least
19 two types of menus, Hidden Menus 1380 and Program Overlay Menus 1390.

20 To avoid disturbing a subscriber during viewing of a program, the Hidden Menus 1380
21 are not shown to the subscriber but instead "reside" at the set top terminal 220 microprocessor
22 602. The microprocessor 602 awaits a button entry either from the remote control 900 or set
23 top terminal 220 buttons before executing or displaying any Hidden Menu 1380 options. The
24 set top terminal software provides the subscriber with additional functions such as entering an
25 interactive mode or escaping from a selected program through use of Hidden Menus 1380.

26 Program Overlay Menus 1390 are similar to Hidden Menus 1380. However, the
27 Program Overlay Menus 1390 are overlaid onto portions of the displayed video and not

1 hidden. The software for the Program Overlay Menus 1390 allows the subscriber to continue
2 to watch the selected television program with audio but places graphical information on a
3 portion of the television screen. Most Program Overlay Menus 1390 are graphically generated
4 to cover small portions of video. Some Overlays 1390 which are by their nature more
5 important than the program being viewed will overlay onto greater portions of the video.
6 Examples of types of overlay menus 1390 include Notification Menus 1392 and Confirmation
7 Menus 1394. In the preferred embodiment, the software for the Program Overlay Menus
8 1390 controls the reduction or scales down the (entire) programs video and redirects the video
9 to a portion of the screen.

10 Submenus provide the cost of viewing the program and the program's length in hours
11 and minutes. From the submenus, the subscriber is given at least three options: (1) to purchase
12 a program, (2) to return to the previous menu, and (3) to press "go" and return to regular TV.
13 The subscriber may also be given other options such as previewing the program.

14 Using an on-screen menu approach to program selection, there is nearly an unlimited
15 number of menus that can be shown to the subscriber. The memory capability of the set top
16 terminal 220 and the quantity of information that is sent using the program control information
17 signal are the only limits on the number of menus and amount of information that can be
18 displayed to the subscriber. The approach of using a series of menus in a simple tree sequence
19 is both easy for the subscriber to use and simply implemented by the set top terminal 220 and
20 remote control device 900 with cursor movement. A user interface software programmer will
21 find many obvious variations from the preferred embodiment described.

22 The set top terminal 220 generates and creates menus using, in part, information stored
23 in its graphics memory. A background graphics file 800 will store menu backgrounds and a
24 logo graphics file will store any necessary logos. A menu display and cursor graphics file will
25 store menu display blocks and cursor highlight overlays as well as any other miscellaneous files
26 needed to build the menus. Using this method of storing menus, the menus can be changed by

1 reprogramming the graphics memory of the set top terminal 220 through instructions from either
2 the network controller 214 or operations center 202.

3 The microprocessor 602 performs the steps required to create a menu using stored
4 information. The microprocessor 602 fetches a background file, logo file, menu display and
5 cursor file in most instances. The microprocessor 602 fetches text from long-term,
6 intermediate-term, or short-term storage depending on where the text is stored. Using a video
7 combiner (or like device), the stored information is combined with video and the entire image
8 is sent to the television screen for display.

9 In the preferred embodiment, a graphics controller is used to assist the set top terminal
10 220 in generating menus. Menu generation by the set top terminal 220 begins with the building
11 of a major menu screen, which includes background graphics for that major menu. The
12 background graphics may include an upper sash across the top of the screen and a lower sash
13 across the bottom of the screen. The background graphics may be generated from the
14 background graphics file 800 in the memory files of the graphics memory (preferably
15 EEPROM). In addition, logo graphics may be generated. Such graphics typically include an
16 icon window, a cable company logo, a channel company logo, and two "go" buttons.

17 Preferably, the text for each major menu is generated separately by a text generator
18 in the set top terminal 220. Those portions of the text that generally remain the same for a
19 period of weeks or months may be stored in EEPROM or other local storage. Text which
20 changes on a regular basis, such as the movie titles (or other program selections), is transmitted
21 to the set top terminal 220 by either the operations center 202 or the network controller 214
22 of the cable headend 208. In this manner, the cable headend 208 may change the program
23 selections available on any major menu 1020 by modifying the program control information
24 signal sent by the operations center 202 and transmitting any changes using the STTCIS.

25 Day, date and time information are added to each major menu. This information is sent
26 from the operations center 202, the cable headend 208 (signal processor 209 or network
27 controller 214), the uplink site, or generated by the set top terminal 220 internally.

1 The creation and display of program description submenus is performed by the set top
2 terminal 220 in a manner similar to that described above. Each submenu may be created in
3 parts and combined before being sent to the television screen. Preferably, background
4 graphics and upper and lower sashes are used. Likewise, a video window and half-strip
5 window can be generated from information in storage on the EEPROM.

6 In addition to graphics and text, some submenus include windows that show video.
7 Such video may be still or moving pictures. Still pictures may be stored in a compressed format
8 (such as JPEG) at the set top terminal 220. Video stills may be transmitted by the operations
9 center 202 through the program control information signal from time to time.

10 Moving video picture is obtained directly from a current video feed as described
11 above. Depending on video window size, this may require manipulation of the video signal,
12 including scaling down the size of the video and redirecting the video to the portion of the menu
13 screen which is within the video window of the menu. Alternatively, the video may be obtained
14 from a split screen channel. Such a method involves the use of split screen video techniques
15 to send multiple video clips on a single channel at a given time. The set top terminal 220 would
16 scale the picture, if necessary, and redirect it to the correct position on the screen using known
17 scaling and positioning techniques. Additional circuitry may be required in the set top terminal
18 220 to perform adequate scaling and repositioning.

19 To avoid the need for redirecting video into the portion of the screen which houses the
20 video window, masking and menu graphics may be used to cover the portions of the channel
21 video that are not needed. This masking technique allows the split screen video to remain in
22 the same portion of the screen that it is transmitted by the operations center 202. The masking
23 is then adjusted to cover the undesired portions of the screen. These masks are stored in the
24 background graphics file similarly to other background files for menus.

25 The split screen video technique may also be used for promoting television
26 programming. Since a great number of short video clips may be sent continuously, full or partial
27 screen promotionals (or informationals) may be provided to the subscriber. With this large

1 quantity of promotional video, the subscriber is given the opportunity to "graze" through new
2 movie or television programming selections. The subscriber simply grazes from promotional
3 video to promotional video until the desired television program is discovered.

4 To support video calling, a video call options menu 1022 is preferably provided. In
5 the video call options menu 1022, the user can set up such things as turning caller ID on/off,
6 turning automatic program pausing on/off, the default state of the video camera 2000 (on or
7 off), time periods when calls shall not interrupt programming and shall be automatically
8 messaged instead (e.g., during favorite programs), how video call images are displayed (e.g.,
9 picture-in-picture, on a blue screen or on a paused image of the current program).

10 C. Detailed Description of Advanced Set Top Terminal

11 1. Overview

12 The present invention relates to advances in the set top terminal 220 described above.
13 In particular, the present invention may be achieved through a set of hardware upgrades or
14 additions to the following embodiments: (1) an existing set top converter (not shown) upgraded
15 with a Turbo Card 700 or the like; (2) an industry standard digital decompression converter
16 box (as shown in Figures 9a and 9b below) upgradeable by either an upgrade module or a
17 menu generation card; or (3) a set top terminal 200 capable of both decompression and menu
18 generation. The set of hardware upgrades described below can be used to provide additional
19 advanced features and functional capabilities to any of these embodiments.

20 Table A shows several exemplary hardware configurations that may be used to achieve
21 the goals of the present invention. In particular, Table A shows four columns of set top
22 converter technology, which may be modified to produce the various set top capabilities shown
23 in the three rows of the table.

24 The table shows the various inherent functional capabilities of each set top converter,
25 and how each may be modified or upgraded, if necessary, to achieve the objectives of the
26 present invention. From left to right, the columns of the table span the various alternatives for

balancing those capabilities that may be built into set top converters or terminals, on the one hand, and those capabilities that can be provided through, for example, an upgrade module, expansion card or hardware upgrade of the present invention, on the other. This balance allows a designer or manufacturer of set top converters to choose between adding advanced functionality to an existing converter box or, instead, producing a converter with additional built-in features that increase cost and complexity of the converter or terminal.

TABLE A

	Existing Analog Set Top Converter	Set Top Converter With Digital Decompression Capability	Set Top Converter With Digital Decompression And Menu Generation Capability	Advanced Set Top Terminal
Decompression Capability	N/A	Built-In	Built-In	Built-In
Menu Generation Capability	Turbo Card	Upgrade Module or Menu Generation Card	Built-In	Built-In
Advanced Features	Level A-C Hardware Upgrades or Expansion Card	Level A-E Hardware Upgrades or Expansion Card	Level A-E Hardware Upgrades or Expansion Card	Built-In

The first column of Table A shows how an existing analog set top converter can be modified to provide menu generation capability through the use of the Turbo Card. In addition to the Turbo Card, such an existing analog set top converter may be further modified to provide any of the advanced features described below through the use of the Level A, Level B and Level C hardware upgrades or an expansion card. Such existing set top converter boxes are currently manufactured by Scientific Atlanta and General Instruments, among others. These converter boxes have been designed for use with analog waveforms and, as a result, digital decompression capabilities are not applicable.

1 The second column of Table A shows a set top converter with digital decompression
2 capability. This converter is a simple decompression box which may eventually become the
3 industry standard. The simple decompression boxes may be modified to provide the enhanced
4 functionality of the present invention. For example, a simple decompression box may be
5 modified to produce menu generation capability through the use of an upgrade module or menu
6 generation card. In addition, other advanced features may be added to a simple
7 decompression box through modifications that include any of the Level A through E hardware
8 upgrades or an expansion card. Each of these modifications are described below.

9 The third column of Table A shows a set top converter that has built-in digital
10 decompression and menu generation capabilities. Thus, in order to achieve the enhanced
11 functionality of the present invention, other advanced features may be provided through
12 hardware modification. Such modification may be accomplished through the use of any of the
13 Level A through E hardware upgrades or the expansion card, as explained below.

14 The fourth column of Table A shows an advanced set top terminal having
15 decompression, menu generation, and advanced functional capabilities. Each of these
16 capabilities are built in to the terminal itself. In this way, achieving the enhanced performance
17 of the set top terminal in accordance with the present invention would require no hardware
18 modification.

19 In the preferred embodiment, the advanced set top terminal 220 of the present
20 invention has the capability, among other things, of receiving tiered programming from the
21 network controller. Tiered programming allows different users to view different video even
22 though the subscribers are "tuned" to the same channel. For example, the network controller
23 214 may know the demographics of its subscribers through a database, by "learning" from
24 prior subscriber choices, from an interactive selection, or from other means. Using the
25 demographics information, the network controller 214 may target commercials to the correct
26 audience by showing different commercials to subscribers with different demographics. Even
27 though subscribers will believe they are "tuned" to one channel, each subscriber will be

1 switched to a different channel for the tiered video. Alternatively, subscribers may be offered
2 an option of several commercials from which to choose.

3 To accommodate foreign speaking subscribers, multiple audio channels for television
4 programming may be provided. In this way, the subscriber may be shown menus of programs
5 available in the subscriber's native language. The function of choosing the correct audio to
6 correspond to the selected language may be handled by either the set top terminal 220 or the
7 network controller 214 depending upon the configuration. Local programming in several
8 languages or additional audio channels for a foreign language translation of a popular television
9 program may be provided by the network controller 214. Using a picture-on-picture feature,
10 sign language may be similarly made available to certain set top terminals 220 for the deaf.
11 Also, a text overlay may easily be produced on the lower part of the screen for the deaf.

12 Typically, each video signal is received at the set top terminal 220 along with four audio
13 channels. Two of these audio channels will preferably be used for left and right stereo audio
14 reception of the video signal being displayed. The remaining two audio signals may be used
15 for alternative languages. For example, where a video signal is received by the set top terminal
16 220, two of the audio channels will provide the stereo audio signals for that video in English,
17 with the other two audio channels providing mono audio signals in French and Spanish. In this
18 way, each video signal received at the set top terminal 220 can accommodate at least two
19 foreign languages. Where stereo audio channels are not desired, the audio channels in English
20 can be set to a single signal, providing mono audio reception, and increasing the multiple
21 language audio channel capability to three foreign languages.

22 In other embodiments, the network controller 214 can act as a central computer and
23 provide intra-set top terminal interactive games, inter-set top terminal interactive games,
24 computer bulletin board type services, message services (Electronic mail) etc. For example,
25 a subscriber may play war games with five (anonymous) fellow subscribers each in their own
26 home each operating a separate tank. The network controller 214 gathers the players via set
27 top terminal 220 communications and acts as the referee. A bulletin board or message system

can be set up to discuss a particular program such as "Twin Peaks Whodunit" for enthusiasts. These interactive features are further described below with the interactive services level B menu and the set top terminal hardware upgrade level B interactive unit.

In order to achieve the required throughput of video and audio information for the system, digital compression techniques for video are employed. As a result, the set top terminal 220 typically must decompress any digitally compressed program signals that it receives. Methods of decompression are a function of the compression technique used in the program delivery system.

There are three basic digital compression techniques: within-frame (intraframe), frame-to-frame (interframe), and within-carrier compression. Various compression methods may be used with these techniques. Such methods of compression, which include vector quantization and discrete cosine transform methodologies, are known to those skilled in the art.

Several standard digital formats representing both digitizing standards and compression standards have also been developed. For example, JPEG (joint photographic experts group) is a standard for single picture digitization. Motion picture digitization may be represented by standards such as MPEG or MPEG 2 (motion picture engineering group specification). In addition to these standards, other proprietary standards have been developed. Although MPEG and MPEG 2 for motion pictures are preferred in the present invention, any reliable digital format with compression may be used.

Various hybrids of the above compression techniques and methods have been developed by several companies including AT&T, Compression Labs, Inc., General Instruments, Scientific-Atlanta, Philips, and Zenith. Any of the compression techniques developed by these companies, as well as other techniques known to those skilled in the art, may be used with the present invention.

2. Advanced Set Top Terminal Major Components and Upgrades

a. Decompression Box with Upgrade Module

1 The preferred program delivery system uses digitally compressed signals and, as a
2 result, the preferred subscriber equipment configuration must be capable of decompressing and
3 processing such digitally compressed signals. Figure 9a diagrams the basic interplay between
4 an upgrade module 700 and a simple decompression box 302. The upgrade module 300 can
5 be connected to the decompression box 302 through a port similar to the upgrade port 662
6 described above (Figure 5b). The simple decompression box 302 shown is preferably a future
7 industry standard decompression box capable of communicating with an upgrade module 300
8 to enhance functionality.

9 The upgrade module 300 provides menu generation capability to the simple
10 decompression box 302. The microprocessor of the simple decompression box 302
11 communicates with the microprocessor in the upgrade module 300 to provide the full
12 functionality of a set top terminal 220.

13 In the preferred embodiment, multipin connections may be used for a multiwire cable
14 connecting the simple decompression box 302 with the upgrade module 300. The multipin
15 connection may range from DB9 to DB25. A SCSI, or small computer systems interface, port
16 (not shown) may also be provided. Alternatively, four or more ports may be provided instead
17 of the single port depicted. If a port is not provided, the upgrade module may, alternatively,
18 be hard-wired to the simple decompression box 302.

19 As represented generally at 304, the digital data set of output wires of the simple
20 decompression box 302 will preferably output error corrected and decrypted data to the
21 upgrade module 300. The second set of wires, providing the interface connection, allows the
22 microprocessor in the upgrade module 300 to communicate with the microprocessor of the
23 simple decompression box 302. In this manner, the video circuitry of the upgrade module 300
24 and the simple decompression box 302 may maintain synchronization. The third set of wires,
25 providing the decompressed video output, provide the upgrade module 300 with a
26 decompressed video signal to manipulate. The fourth set of wires, comprising the video input

1 set, allows the simple decompression box 302 to accept a video signal that is a combined text,
2 graphics, and video signal.

3 Figure 9a further shows the CATV input 306, video input 308, and video and audio
4 outputs 310, 312, as part of the simple decompression box 302. This embodiment reduces
5 the component cost of upgrade module 300, and thus, is preferred. The upgrade module 300
6 may simply be a cartridge (not shown) insertable into the simple decompression box 302.
7 Alternatively, as shown in commonly numbered Figure 9b, the CATV input 306, video input
8 308 and video and audio outputs 310, 312 may be included as part of the upgrade module
9 300. In this embodiment, the simple decompression box 302 is primarily used for
10 decompressing the video.

11 Referring to Figure 10, the upgrade module 300 preferably includes the following
12 circuitry: a video graphics and text demultiplexer 314; a text and graphics video plane
13 combiner 316; a run length graphics decompressor 318; and, a run length compressed graphics
14 memory 320 (nonvolatile RAM, ROM, EPROM, or EEPROM). By means of
15 communications through the multiwire connection between the upgrade module 300 and the
16 simple decompression box 302, compressed video and control signals may be demultiplexed
17 by the demultiplexer 314 within the upgrade module 300. The run length graphics
18 decompressor 318, through communications with the run length compressed graphics RAM
19 320, permits decompression of the input compressed video signal. The text and graphics video
20 plane combiner 316 allows demultiplexed and decompressed signals to be output, through the
21 simple decompression box 302, to a subscriber's television 222 showing both video and
22 overlay menus with text. Figure 10 shows the elements of a simple decompression box 302
23 (numbered commonly with the elements of the set top terminal 220 depicted in Figure 4) with
24 the upgrade module 300 described above. Generated menus and video are combined in the
25 combiner 316 and output to an antitaping encoder 619. Any method of antitaping encoding
26 known by those skilled in the art may be used with the present invention.

1 Figure 10 also depicts an expansion card 320 and an expansion card interface 320 for
2 receiving the card 320. In addition, error correction circuitry 324 is shown receiving the
3 demodulated signal, prior to demultiplexing the signal. Figure 10 further depicts an optional
4 camera interface 326 and an optional microphone interface 328 for connection with a camera
5 2000 and a microphone 2002, respectively.

6 The enhanced functionality of the upgrade module 300 may alternatively be included
7 on the expansion card 320. In this embodiment, the upgrade module 300 becomes an internal
8 component of the simple decompression box 302 and internally upgrades the box 302 to
9 include menu generation capability without using an external hardware upgrade module 300.
10 Other variations in the upgrade module 300 configuration are also possible.

11 b. Upstream Data Transmission Hardware

12 Figure 11 shows a preferred set top terminal 220 that includes a data receiver 332 and
13 a data transmitter 344. The data transmitter 344 provides upstream data communications
14 capability between the set top terminal 220 and the cable headend 208. Upstream data
15 transmissions are accomplished using the polling system described with reference to Figures
16 7a and 7b above, and, in particular, using a data transmitter 344. Both receiver 332 and
17 transmitter 344 may be built into the set top terminal 220 itself or added through an upgrade
18 module 300. Regardless of the specific hardware configuration, the set top terminal's data
19 transmission capabilities may be accomplished using the hardware shown in Figure 11.

20 Figure 11 shows RF signals, depicted at 330, being received at by a data receiver 332
21 and tuner 603 working in unison. Both of these devices are interfaced with the microprocessor
22 602, which receives inputs, depicted at 338, from the subscriber, either through the set top
23 terminal's keypad 645 or remote control unit 900. All cable signals intended for reception on
24 the subscriber's TV are accessed by the tuner 603 and subsequently processed by the
25 processing circuitry 340. This processing circuitry 340 typically includes additional components

1 for descrambling, demodulation, volume control and remodulation on a Channel 3 or 4 TV
2 carrier.

3 Data targeted to individual set top terminals 220 is received by the data receiver 332
4 according to each set top terminal's specific address or ID (e.g. set top ID 928, 928'). In this
5 way, each addressable set top terminal 220 only receives its own data. The data receiver 332
6 may receive set top terminal specific data in the information field of the program control
7 information signal frame described with reference to Figure 7a or on a separate data carrier
8 located at a convenient frequency in the incoming spectrum.

9 Any received data includes information regarding channels and programs available for
10 selection. The subscriber may enter a series of commands using the keypad 645 or remote
11 control 900 in order to choose a channel or program. Upon receipt of such commands, the
12 set top terminal's microprocessor 602 instructs the tuner 603 to tune to the proper frequency
13 of the channel or program desired and subsequently instructs the processing circuitry 340 to
14 begin descrambling of this channel or program.

15 Upon selection of a channel or program, the microprocessor 602 stores any selection
16 information in local memory for later data transmission back to the cable headend 208.
17 Typically, the data transmitter 344 operates in the return frequency band between 5 and 30
18 MHZ. In an alternative embodiment, the frequency band of 10 to 15 MHZ may be used.
19 Regardless, however, of the frequency band used, the data transmitter 344 sends information
20 to the cable headend 208 or network controller 214 in the information field of the frame
21 described with reference to figure 7b. Those skilled in the art will recognize that a number of
22 variations and combinations of the above-described set top terminal 220 hardware components
23 may be used to accomplish upstream data transmissions.

24 c. Hardware Upgrades

25 In order to enhance a set top terminal's 220 functionality, the following hardware
26 upgrades may be used: (1) a Level A interactive unit, (2) a Level B interactive unit, (3) a Level
27 C interactive unit with compact disc capability, (4) a Level D digital radio tuner for separate

1 room use, and (5) a Level E information download unit. Each of these upgrades is connected
2 to the set top terminal 220 unit through the upgrade port 662 described earlier.

3 Level A, B and C hardware upgrades have similar hardware components. Figure 12a
4 diagrams the basic components of the Level A, B and C hardware upgrades, indicated
5 generally at 100. The figure diagrams the interaction between the hardware upgrades 100 and
6 the set top terminal's 220 basic components. As seen in the figure, CATV input signals are
7 received by the set top terminal 220 using a tuner 603 and various receiver components
8 described above (but denoted generally at 601 in Figures 12a and 12b). The set top terminal's
9 microprocessor coordinates all CATV signal reception and also interacts with various upstream
10 data transmission components 604, which have been described above.

11 The Level A, B and C hardware upgrades 100 each include a microprocessor 104,
12 interactive software 106, processing circuitry 108, bubble memory 112, and a long-term
13 memory device 116. In addition to these basic components, the Level B hardware upgrade
14 makes use of an additional telephone modem 120, while the Level C hardware upgrade makes
15 use of an additional CD-ROM storage device 122.

16 Along with their basic components, the Level A, B and C hardware upgrades 100 each
17 use their own interactive software 106. This software may be used to provide the enhanced
18 functional capabilities described below. The Level A, B and C hardware upgrades also make
19 use of processing circuitry 108, which allows the set top terminal 220 to pass the subscriber's
20 interactive input to the Level A, B and C hardware upgrades 100 for interpretation. These
21 commands are passed through the interface linking the set top terminal's microprocessor with
22 the microprocessor of the Level A, B and C hardware upgrades 100. In this way, subscriber
23 inputs, entered through the set top terminal keypad or remote control, can be transferred to any
24 of the hardware upgrades for processing and responses generated therein can then be sent
25 back to the set top terminal 220 for display. In the preferred embodiment the IR commands
26 are transferred from set top terminal to hardware upgrade.

1 The Level A, B and C hardware upgrades 100 also include a long-term memory
2 component or device 116 that allows each hardware upgrade to internally store data used with
3 each interactive service. Such data may include, for example, customized menu templates used
4 by the individual interactive services. In addition, the Level A, B and C hardware upgrades
5 include a bubble memory 112 for the temporary storage of, for example, interactive questions
6 and responses used in each particular interactive service.

7 The Level A interactive unit allows the subscriber to access interactive services offering
8 additional information about programs such as quizzes, geographical facts, etc. This information
9 may be received by the set top terminal 220 in several data formats, including using the vertical
10 blanking interval (VBI) or the program control information signal. The Level A interactive unit
11 enables the subscriber to engage in textual interactivity with the current television program using
12 overlay menus. Some examples are quizzes, fast facts, more info, where in the world,
13 products, etc, all of which provide the subscriber with an interactive question and answer
14 capability. Although the Level A interactive capability can easily be built into the set top
15 terminal 220, such an embodiment increases the cost of the basic set top terminal 220.

16 The Level B interactive unit provides the user with access to online data base services
17 for applications such as home shopping, airline reservations, news, financial services, classified
18 advertising, home banking, and interactive teletext services. For example, with this upgrade,
19 a user will be able to reserve plane tickets or buy consumer electronics. The primary feature
20 of this upgrade unit is that it allows actual transactions using two-way communications over
21 modem with outside services. This added two-way communications capability may be with the
22 cable headend 208 or, alternatively, over cellular networks, PCN or other communications
23 media.

24 The Level C interactive unit employs a high volume local storage capacity, including
25 compact disc or other random access digital data formats (e.g., CD-ROM 122). This unit
26 allows use of interactive multi-media applications. Such applications include, for example,
27 computer games, multi-media educational software, encyclopedias, other reference volumes

1 (e.g. Shakespeare library), etc. In the preferred embodiment, many of these applications will
2 interact with live programming providing additional information and interactivity to the basic
3 program feed. For example, a viewer watching a show set in a foreign country may be able
4 to retrieve additional information, maps, economic data, as well as other information about that
5 country that are stored on the compact disc. In the Level C applications, the upgrade
6 hardware may closely monitor the television broadcast through additional data channels (e.g.,
7 vertical blanking interval, or other digital data encoded within live video) providing context
8 sensitive interactivity.

9 Figure 12b diagrams the interaction between the set top terminal 220 and the Level D
10 hardware upgrade, indicated generally at 130. As shown in the figure, the CATV signals are
11 input to the set top terminal 220 through its tuner 603 and receiver components 601. As
12 described above, the microprocessor 602 coordinates all cable television signal reception by
13 the set top terminal 220. The Level D hardware upgrade 130 makes use of a microprocessor
14 132, a tuner 134, a demodulator 136, a demultiplexer 138, a decryptor 140 and an audio
15 decompressor 142.

16 As shown in the figure, the set top terminal 220 and the Level D hardware upgrade 130
17 interact through the interface linking the respective devices. The set top terminal's
18 microprocessor 602 instructs received signals to be transferred to the Level D hardware
19 upgrade 130 for further processing. These received signals are input to the Level D hardware
20 upgrade, passed through the signal path comprising the tuner 134 and other digital audio
21 reception components (i.e., demodulator 136, demultiplexer 138, decryptor 140 and audio
22 decompressor 142). Through the use of the hardware as configured in Figure 12b, the
23 subscriber can select a digital audio program for listening. The subscriber can accomplish such
24 selection through a subscriber interface (not shown), which may exist at the set top terminal 220
25 or, alternatively, at the Level D hardware upgrade.

26 The Level D hardware upgrade allows the subscriber separate access to the digital
27 radio channels while other programming (not necessarily radio) is being viewed on the

1 television. Typically, this upgrade would be used for digital radio usage in a separate room
2 from that of the television. The upgrade has a separate tuner, decompressor, and visual
3 display. In the preferred embodiment a second remote control (which is preferably a scaled-
4 down version of the set top terminal remote control, described below) is provided to access
5 the digital audio system. This remote is equipped with a display.

6 The Level E hardware upgrade allows the subscriber to download large volumes of
7 information from the operations center 202 or cable headend 208. The Level E hardware
8 upgrade will enable subscribers to download data, such as books and magazines, to local
9 storage. Primarily, the Level E hardware upgrade is an additional local storage unit (e.g., hard
10 disk, floppy, optical disk or magnetic cartridge). Preferably, a small portable reader, called
11 "EveryBook™", is also provided with the upgrade to enable downloaded text to be read
12 without the use of a TV. The portable reader is equipped with a screen.

13 The downloadable information may be text or video supplied by the operations center
14 202 or cable headend 208. With this upgrade, books may be downloaded and read anywhere
15 with the portable reader. Using this upgrade, video may be downloaded and stored in
16 compressed form for later decompression. The video would be decompressed only at the time
17 of viewing. Important text that the public desires immediate access may made available through
18 this system. Text such as the President's speech, a new law, or a recent abortion decision
19 rendered by the Supreme Court may be made immediately available.

20 Using a more sophisticated port, such as the SCSI port, multiple hardware upgrade
21 units may be connected, or "daisy-chained" together, to operate simultaneously. Although
22 these upgrade units are described separately, the units may be combined or built into the set
23 top terminal 220. Those skilled in the art will recognize variations on such combinations of and
24 additions to the set top terminal hardware.

25 d. Expansion Card Slot

26 In order to provide the greatest flexibility possible and prevent a set top terminal 220
27 from becoming outdated during the terminal's useful life, additional electronic expansion card

1 slots have been built into the preferred embodiment. The expansion slots 665 (depicted in
2 phantom in Figure 5b) are covered by the metal plate cover 664 as shown in Figure 5b. It is
3 anticipated that additional memory or capabilities may be needed for certain customer features
4 and also to update the system as the cable delivery system's capabilities increase.

5 In addition to providing an additional memory capability, the expansion card slot
6 provides an easy method to upgrade the set top terminal hardware. In particular, expansion
7 cards can be used to internally provide any of the Level A through E hardware upgrade
8 features described above. Such embodiments, however, use the upstream data transmission
9 hardware, also described above (or built-in modem).

10 Functionally, the expansion card (not shown) may be inserted into an expansion card
11 slot 665, causing the connector on the expansion card to electrically link with a connector on
12 the set top terminal 220. Preferably, the frame of the set top terminal has a shelf or rack
13 position to hold the expansion card. The connector on the set top terminal 220 may simply be
14 an electrical connection to the set top terminal's microprocessor and/or memory device or
15 devices. Alternatively, the interface between the expansion card and the set top terminal 220
16 may be an electrical bus that allows the memory resources of the set top terminal 220 to be
17 directly expanded. In this case, the expansion card itself contains a memory device or devices
18 that expand the amount of program information or data that the set top terminal 220 may
19 access. Such memory devices include RAM, ROM, EPROM or EEPROM. In addition, the
20 interface may be a "mailbox," which resides in the set top terminal 220 as a single memory
21 location. This embodiment facilitates the transfer of data between the set top terminal 220 and
22 the expansion card in either serial or parallel format. Such transfers are coordinated and
23 controlled by the set top terminal's microprocessor 602.

24 The use of expansion cards lowers the cost of the set top terminal 220 itself, while also
25 increasing its potential functionality. Thus, an expansion card may include enhanced functional
26 capabilities described as part of the upgrade module discussion above and be designed to
27 accommodate any hardware upgrade compatible with the set top terminal 220.

3. Remote Control and Subscriber Access of Set Top Terminal

The subscriber can access programs televised by the system through the set top terminal 220 using a remote control 900. Figure 13a shows a two-section remote control 900 that accommodates such access. To reduce costs and make the set top terminal 220 as user friendly as possible, a standard television remote control 350, such as a Jerrold RC 650 remote control or the like, may be augmented by adding a new section 352 that provides the additional digital menu access and ordering functions. Figure 13a depicts the addition of menu access and cursor movement control to the remote control 900.

The remote control 900 has an ordering button 354 and four-way cursor movement 356 that includes a "go" button 358 and menu access buttons 360. The preferred remote control 900 operates using infrared (IR) signals, with the signals being received by the infrared (IR) sensor 630 on the front of the set top terminal 220.

In the simplest embodiment, the remote 900, may be built with only cursor movement and a go button. In more sophisticated embodiments, the remote control 900 may be provided with buttons that are programmable to perform specific functions for a series of entries. An intelligent or smart remote control 900 would increase both the cost and capability of the set top terminal 220 system. Using the augmented remote control 900 depicted in Figure 13a, a subscriber can navigate the program menu system of the set top terminal 220.

Figure 13b shows an alternative and preferred embodiment of the remote control 900 for use in the present invention. Standard television receiver remote control switches or buttons 362 may be used, including volume control, channel select, power and signal source buttons, as well as other menu buttons 364, including cursor movement, cursor select, menu select, and pay television buttons arranged longitudinally on the remote control 900, as opposed to the width-wise separation, as shown in Figure 13a. The color of the buttons or the surrounding background may differ between the standard television remote control buttons 362 and the menu buttons 264 to differentiate visually between these two groups of buttons.

1 The width and depth of the remote control unit 900 are considerably less than the
2 length to allow the remote control unit 900 to fit easily within a user's palm. The remote control
3 unit 900 preferably has its center of mass balanced substantially near the longitudinal middle.
4 This balance allows a user's thumb to naturally be placed in substantially the middle portion of
5 the remote control unit 900, when it is picked up by a user.

6 Since the center of mass of the remote control unit 900 is placed substantially near the
7 longitudinal middle of the remote control unit 900 (thereby having a user's thumb naturally fall
8 in this same center region), the standard remote buttons 362 and menu access switches or
9 buttons 364 most frequently accessed and depressed by a user are placed in the central region
10 of the remote control unit 900 within easy reach of the user's thumb. Channel and volume
11 increment and decrement buttons 366 are placed near this center of mass and longitudinal
12 center line. The channel buttons 366 are preferably beveled in opposing directions to allow a
13 user to feel for and press a desired button without looking down at remote 900. Similarly, the
14 volume buttons 368 are preferably beveled in opposing directions for the same reason.
15 Additionally, the channel buttons 366 could have a surface texture different from those of the
16 volume buttons 368 to allow even easier differentiation.

17 Also placed in the longitudinal center, within easy reach of a user's thumb, are cursor
18 movement buttons 370 and a "go" button 372. The "go" button 372 selects an option
19 corresponding to the placement of the cursor. As opposed to buttons, a joystick may be used
20 with a selection on the stick, or a trackball, depressible for selecting a desired choice. The
21 cursor buttons 370 are placed ninety degrees apart, with the "go" button 372 placed within the
22 center of the cursor movement buttons 370, as shown in Figure 13b. The cursor movement
23 buttons 370 are preferably beveled inwardly toward the "go" button 372 and the "go" button
24 372 is recessed below the level of the cursor movement buttons 370 so that it is not
25 accidentally pressed while depressing the cursor movement buttons 370. In addition to the
26 beveling on the cursor movement buttons 370, these buttons may also have a surface texture
27 to allow a user to feel for and select the appropriate button without looking down at the remote

1 900 and directional arrows could be raised or recessed on the surface of the cursor movement
2 buttons 370 for this same purpose.

3 Menu select buttons 374 are placed near buttons 370 as shown in Figure 13b. Menu
4 select buttons 374 are preferably the largest buttons on the remote control unit 900. Menu
5 select buttons 374 preferably have icons or other graphics imprinted on their top surface or
6 adjacent to corresponding buttons. For example, a button for the sports major menu may
7 contain a baseball icon. The icons represent the programming available on the particular major
8 menu selected by the menu select buttons 374. The icons may also be raised above the level
9 of the menu select buttons to provide a textured surface. This textured surface would allow a
10 user to select an appropriate menu button 374 by feel, without looking at the remote control
11 unit 900. The icons would require substantial differences in texture, while still providing a
12 meaningful graphic related to the associated menu.

13 As shown in Figure 13b, labels and icons are provided for the following major menus:
14 movies, sports, children's programming, documentary/news, entertainment, magazines,
15 programming guide, HDTV (high definition television), interactive TV, music, and an additional
16 button 376 for further programming. Menu select buttons 374 may also be labeled A through
17 J for the above programs, with the last button for all additional major menus labeled K-Z.

18 Although the remote control unit 900 is described with a variety of channel selection
19 buttons, nearly all buttons from a standard remote control (section 362 buttons) could be
20 eliminated. The present invention would allow a subscriber to use a remote control unit 900
21 containing only menu select buttons 374 and/or cursor movement and select buttons, 370, 374,
22 respectively.

23 As used herein, "button" is contemplated to include all manner of switches or touch
24 sensitive circuitry to activate a particular function in the remote control unit 900. Additionally,
25 although the remote control unit 900 communicates with the set top box by means of infrared
26 transmission, other forms of communication are contemplated, including ultra-sound, radio
27 frequency and other electromagnetic frequency communication.

1 To support video calling capabilities, the remote control unit 900 preferably includes
2 a call answer button (not shown) and a call hangup button (not shown). The call answer button
3 and the call hangup button may be separate buttons or the same button. To support video
4 calling with outgoing video, the remote control unit 900 preferably includes a camera activation
5 button (not shown) and buttons or other controls for pointing the camera 2000. The cursor
6 movement buttons 370, a joystick, a trackball or something similar can be used for camera
7 pointing in a camera control mode.

8 4. Advanced Features and Functional Capabilities

9 a. Overview

10 In the preferred embodiment, the set top terminal 220 will include features that are now
11 being adopted in the industry, including parental controls and locks, electronic diagnostics and
12 error detection, muting, on-screen volume control, sleep timer, recall of last selection, etc.
13 Each of these features has a corresponding menu (or overlay menu) that allows on-screen
14 customizing and activation of the feature.

15 The preferred set top terminal 220 also supports a number of advanced features and
16 functional capabilities. This set top terminal 220 provides subscribers with a picture-on-picture
17 capability without requiring a special television to support the capability. The set top terminal
18 220 also supports a program catalogue Service, which provides subscribers with information
19 on all programming available at its particular subscriber location. The set top terminal 220
20 further includes the capability of querying viewers to establish, among other things, favorite
21 channel lists, personal profile data and mood information. The set top terminal 220 allows the
22 subscriber to view promotional menus on future programming events.

23 The set top terminal 220 supports additional capabilities using its hardware upgrades
24 that allow subscribers to use other interactive services, for example, to engage in on-line
25 question and answer sessions, to order and confirm airline tickets, and to access a variety of
26 other data services. The set top terminal 220 makes use of a digital tuner as a hardware
27 upgrade to provide subscribers with a digital audio capability.

1 The preferred set top terminal 220 may be used to control video tape machines,
2 thereby simplifying the recording of programs. The set top terminal 220 can, in conjunction
3 with the program delivery system, easily support high definition television (HDTV). For
4 subscribers living in remote locations, the set top terminal 220 accommodates backyard satellite
5 systems.

6 In addition to all the features that the set top terminal 220 supports with its current
7 internal programming and upgradeability, additional features may be added or existing features
8 increased through remote reprogramming of the set top terminal 220. Utilizing the resident
9 operating system on the read only memory (ROM), the cable headend 208 is able to
10 reprogram the random access memory (RAM) of the set top terminal 220. With this capability,
11 the cable headend 208 can remotely upgrade software on the set top terminals 220.

12 Reprogramming will occur by using the program control information signal, with the
13 appropriate signals sent over this signal. In an alternative embodiment, one channel is dedicated
14 for the special programming needs. When reprogramming is to occur, the cable head end will
15 send an interruption sequence on the program control information channel that informs the set
16 top terminal 220 that reprogramming information is to follow.

17 b. Picture-On-Picture Capability

18 Although the preferred embodiment of the present invention decompresses one channel
19 at a time for the viewer, users who desire a picture-on-picture capability can be provided with
20 a set top terminal 220 have upgraded hardware components that allow two channels to be
21 tuned and decompressed at any given time, and video from a video call to be combined with
22 one or both video programs. Once two signals are available, the picture-on-picture capability
23 can be made fully available in the set top terminal 220, without requiring a special television.

24 Figure 14 diagrams one embodiment for implementing the picture-on-picture capability.
25 Such implementation necessarily requires the use of two tuners 603, 603' and two
26 decompressors 618, 618' so that two separate video programs may be displayed
27 simultaneously on the subscriber's television screen. As shown in the figure, the CATV input

1 signal is received by the set top terminal 220 and input into two separate tuners. These tuners
2 will each tune to a separate television program, both of which will be simultaneously displayed
3 on the subscriber's television. The two television programs are extracted from the CATV input
4 signal by the two parallel signals paths depicted in Figure 14.

5 Each signal path is substantially identical (therefore the components thereof are
6 commonly numbered, with callout numbers of the components of one path carrying the prime
7 indicator) and thus, only one path will be described. Each signal path shown includes a tuner
8 603, a demodulator 606, a demultiplexor 609, a decryptor 600 and various decompression
9 devices. As the respective signals pass through these devices, the microprocessor 602
10 coordinates the signal processing to produce a decrypted program signal. The decrypted
11 program signal is further partitioned between audio, on the one hand, and video, graphics and
12 text, on the other. The audio signals extracted are passed to an audio decompressor 612,
13 which further processes the audio for output to the subscriber's television.

14 The embodiment diagramed in Figure 14 shows only single audio channels for each
15 video channel tuned by the individual tuners. As described above, the number of audio
16 channels will typically include four audio signals corresponding to a single video channel. At
17 least two of these audio signals may be used for stereo television play. Although the subscriber
18 can view two separate video pictures simultaneously through the picture-on-picture capability,
19 the subscriber's television can only accommodate a single audio signal at a time (or two audio
20 signals for stereo audio reception). Thus, the set top terminal hardware shown in Figure 14
21 must also include a switch (not shown), which accommodates the simple switching between
22 each audio signal or signals that correspond to one video picture or another. Such an audio
23 switch, which is a component well known in the art, allows the subscriber to listen to the audio
24 of one picture or the other. The video, graphics and text portion of the program signal are
25 routed through another demultiplexor 314, which, in turn, separates all video, graphics and text
26 of the signals. These signal parts are stored in a memory device 620 within the set top terminal
27 220. This memory device may be a ROM, RAM, EPROM, or EEPROM.

1 The microprocessor 602 initiates and coordinates further decompression of the video,
2 graphics and text for each of the program signals. Once these signal parts are decompressed
3 within the set top terminal 220, these components are passed to a video combiner 316. The
4 video combiner correlates and combines the video, graphics and text of the two program
5 signals. The video combiner outputs these two signals for display on the subscriber's television.
6 These signals may also pass through an NTSC encoder 625 to produce analog NTSC video
7 waveforms, which may likewise be displayed on the subscriber's television. Such display
8 necessarily requires that each signal pass through an RF modulator 605 in order to be input into
9 a television. In this way, two separate RF video outputs are produced. Each video signal
10 produced by the RF modulators has its own corresponding audio outputs produced by each
11 audio decompressor.

12 Each video signal (and its corresponding audio signal) produced by the two tuner
13 configuration can be simultaneously displayed on the subscriber's television, which has a
14 picture-on-picture capability, or, alternatively, the set top terminal 220 itself can create the
15 picture-on-picture image for display. Such display involves the scaling and repositioning of one
16 of the video (and audio) signals so that both pictures produced can be viewed simultaneously.
17 In so doing, the subscriber's television can display one of the pictures as a full screen display,
18 with the other picture being displayed as a scaled and repositioned display overlayed on the
19 full screen display. To implement such a technique, the set top terminal 220 must include the
20 hardware components necessary to produce a picture-on-picture capability, including hardware
21 capable of scaling, repositioning and overlaying images. Such an advanced set top terminal 220
22 allows the subscriber to make use of a picture-on-picture capability even though the
23 subscriber's television cannot alone produce such a result.

24 The video combiner 316 can also combine with one or both of the program video
25 signals video from one or more video calls.

26 c. Program Catalogue Service

1 Referring to Figure 15 and to Figure 8, in the preferred embodiment of the present
2 invention, program catalogue menu 1100 listing programs available on network schedules, will
3 be available as a major menu of the type shown as 1020. In the preferred embodiment, the
4 major program catalogue menu 1100 would offer submenus, such as network schedules for the
5 next seven days, today's network schedules for the next six hours, and TV program catalogue
6 picks for the next seven days.

7 In order for the set top terminal 220 to provide a program catalogue service, the set
8 top terminal 220 must receive information on all programming available at its particular
9 subscriber location. This information will be sent to each set top terminal 220 as part of the
10 program control information signal or STTCIS. The program control information signal would
11 include, among other things, all programming scheduled for the next 7 days. This programming
12 information would, for example, include the name of each program, the type of program, the
13 program start time, the length of the program, the date the program will be shown, a brief
14 description of the program and whether or not the program is closed-captioned, among other
15 information.

16 All programming information sent to the set top terminal 220 for use with the program
17 catalogue service will be stored in the set top terminal's internal memory. Upon selection of
18 the program catalogue service by the subscriber, the microprocessor accesses the memory
19 device during its menu generation and creation process. In this way, the programming
20 information will be combined with the program catalogue menu or submenu template to
21 produce the Program catalogue service. The program catalogue service may involve the use
22 of more than one menu, especially where the network scheduling information covers time
23 frames longer than a few days.

24 If the particular set top terminal 220 has been subscribed to the program catalogue
25 service, the subscriber may proceed to a submenu showing schedules of programs. If the
26 subscriber chooses the network schedule submenu 1102, he is offered a list of network
27 schedules to choose from. If a subscriber were to choose, for instance, HBO, an HBO-

1 specific submenu (not shown) would appear and allow a subscriber to choose a date of
2 interest to see what programs are available on that particular date.

3 d. Querying Viewer

4 To support a variety of services, the set top terminal 220 is capable of querying the
5 viewer and recording viewer responses. For example, in order for the set top terminal 220 to
6 establish a favorite channel list as shown at 1100 in Figure 16a depicting the broadcast TV
7 menu 1112, menus querying the subscriber and allowing the subscriber to input his selection
8 of eight favorite channels is displayed.

9 After querying the subscriber for a list of popular shows the terminal displays a
10 submenu allowing the subscriber to choose one of the subscriber's favorite or popular shows
11 for viewing. Although various embodiments of menus are possible, the goals of each are the
12 same -- to eliminate or augment printed guides to television programs. In an alternative
13 embodiment, a program viewing suggestion feature is available as an additional feature. This
14 feature gives the indecisive or lazy viewer suggestions as to which programs the viewer should
15 watch. The set top terminal 220 uses a matching algorithm to accomplish this program
16 suggestion feature. This program suggestion feature is described in detail in U.S. Patent No.
17 5,798,785, dated August 25, 1998, entitled, TERMINAL FOR SUGGESTING
18 PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM,
19 incorporated herein by reference.

20 In order for the set top terminal 220 to make decisions on which programs the
21 subscriber should watch, the terminal must create a personal profile for the particular viewer.
22 From the data in the particular viewer's personal profile and the television program information
23 available in the program control information signal, the set top terminal 220 is able to select a
24 group of programs which the particular viewer is most likely to watch.

25 In order for this feature to operate, a personal profile for each viewer can be gathered
26 by the set top terminal 220 and stored in a memory file. The personal profile consists of
27 demographic information that may be gathered in a number of ways. The set top terminal 220

1 builds the personal profile for each viewer and stores the information in a memory file by viewer
2 name. To build a personal profile in the preferred system, the viewer answers a series of
3 questions presented on a series of menu screens. These personal profile screens request the
4 viewer to input information such as name, sex, age, place of birth, place of lower school
5 education, employment type, level of education, amount of television program viewing per
6 week, and the number of shows in particular categories that the viewer watches in a given week
7 such as, sports, movies, documentaries, sitcoms, etc. Any demographic information which will
8 assist the set top terminal 220 in targeting advertisements to the viewer or suggesting programs
9 may be used.

10 Once a personal profile has been created (in a particular set top terminal 220), it can
11 be indefinitely stored in nonvolatile memory. A selection at the home menu screen 1010
12 (Figure 8) activates the program selection feature. Following activation of the feature, the set
13 top terminal 220 will present the viewer with a series of brief questions to determine the
14 viewer's mood at that particular time, as shown in Figure 16b. For example, the first mood
15 question screen 1114 may ask the viewer to select whether the viewer desires a short (30
16 minute), medium (30-60 minute), or long (60 plus minute) program selection. The second
17 mood question screen 1116 requests the viewer to select between a serious program, a
18 thoughtful program, or a light program, as shown in Figure 16c. And the third mood question
19 screen 1118 requests whether the user desires a passive program or an active program, as
20 shown in Figure 16d. The viewer makes a selection in each question menu, utilizing the cursor
21 movement keys and "go" button on the remote control unit 900.

22 After the viewer has responded to the mood question menus which determine his
23 mood, the set top terminal 220 uses the personal profile information and mood information to
24 find the best programming matches for the viewer. The set top terminal 220 displays an
25 offering of several suggested programs to the viewer. With this program selection feature, the
26 set top terminal 220 can intelligently assist the specific viewer in selecting a television program.

1 The personal profile information may also be used in targeting advertisements. In the
2 preferred embodiment, the network controller 214 can target specific advertisements to
3 individual cable distribution network nodes or, alternatively, to individual subscribers. In order
4 to accomplish the advertisement targeting capability, the network controller 214 transmits
5 packages of advertisements to the cable distribution network nodes or subscribers for eventual
6 display on the set top terminal 220. When the video that the subscriber is watching nears a
7 break for a commercial, a specific advertisement or set of advertisements is specifically targeted
8 to a particular set top terminal 220 based on the personal profile information described above.
9 Although the network controller 214 is the component in the program delivery system which
10 provides this targeting capability, the set top terminal 220 accommodates transparent channel
11 switches to display the targeted advertisement. In this way, although the subscriber thinks that
12 the set top terminal 220 is tuned to a specific channel, an advertisement from another channel
13 is displayed on the subscriber's television.

14 The hardware required to accommodate such transparent channel switching capabilities
15 are shown in Figures 17a and 17b. Figure 17a shows the set top terminal hardware
16 components which accommodate channel switching within a single 6 MHZ channel bandwidth.
17 These components include a tuner 603, a demodulator 606, a demultiplexer 609, a multiplexer
18 400, a decompressor 622, a microprocessor 602, and local memory M. The tuner 603
19 operates by tuning to a specific 6 MHZ bandwidth which includes the displayed video and a
20 number of channels carrying advertisements. The demodulator 606 processes these signals and
21 sends them to the demultiplexer 609, which converts the received signal into separate program
22 and advertisement signals. During this processing, the microprocessor 602 coordinates the
23 demultiplexing of the programming signals. Once the video signal pauses for a commercial
24 break, the microprocessor 602 instructs the multiplexer 400 to select the advertisement or
25 advertisements for decompression and subsequent display on the subscriber's television. This
26 hardware configuration allows the set top terminal 220 to switch between channels within the

1 6 MHZ bandwidth and display various advertisements for viewing, regardless of the video
2 currently being watched by the subscriber.

3 Where a targeted advertisement falls outside the tuned 6 MHZ bandwidth containing
4 the video that the subscriber is currently watching, the hardware configuration shown in Figure
5 17b is used. In this configuration, the microprocessor 602 instructs the tuner 603 to retune to
6 another 6 MHZ channel bandwidth, as represented by bi-directional arrow A.

7 Working together, the microprocessor 602 and tuner 603 allow targeted
8 advertisements, which have been transmitted in another 6 MHZ bandwidth, to be tuned with
9 minimal acquisition time and delay. In particular, this configuration allows the set top terminal
10 220 to tune outside a given 6 MHZ bandwidth (to another 6 MHZ bandwidth) in order to
11 select a targeted advertisement for display. This alternative embodiment may require the use
12 of a full screen mask in order to minimize any annoying screen rolling during the tuning process.
13 The masking is intended to cover any glitches which would otherwise be displayed during the
14 acquisition time (e.g., 0.5 seconds) for retuning to another 6 MHZ channel bandwidth.

15 Where the acquisition time or delay becomes unreasonable, an alternative embodiment
16 (not depicted) can include the use of two tuners similar to the configuration used above for the
17 picture-on-picture capability. This alternative configuration using two tuners trades an
18 increased cost for lower acquisition times. Those skilled in the art will recognize a number of
19 other configurations of set top terminal hardware that will accommodate a transparent channel
20 switching feature. A more detailed description of target advertising and channel switching is
21 provided in co-pending U.S. Patent Application Serial No. 08/735,549, filed October 23,
22 1996, entitled, METHOD AND APPARATUS FOR TARGETED ADVERTISING, and
23 U.S. Patent Application Serial No. 09/054,419, filed April 3, 1998, entitled TARGETED
24 ADVERTISING USING TELEVISION DELIVERY SYSTEMS, incorporated herein by
25 reference.

26 e. Promotional Menus

1 Figure 18 depicts the use of a promotional menu 1120 used to sell subscriptions to
2 services in the system 200. This promotional menu is tailored to Level B interactive services
3 which include a variety of on-line type services such as Prodigy, Yellow Pages, Airline
4 Reservations, etc. A similar menu is used for Level A interactive services that offers
5 subscribers additional information about programs such as quizzes, geographical facts, etc.
6 Such information may be received by the set top terminal 220 in several data formats, including
7 in the vertical blanking interval (VBI) and in the program control information signal.

8 Other promotion menus similar to menu 1120 may be used for the Level C interactive
9 services. The Level C interactive services utilize local storage such as CD technology (e.g.,
10 122) to offer an enormous range of multi-media experiences. The Level C interactive services
11 require a hardware upgrade as described earlier. Specially adopted CD-I and CD-ROM 122
12 units are used for this service.

13 Typically, promotional menus may be generated when a subscriber selects a
14 nonexistent channel, creating a virtual channel. Such virtual channels do not require any
15 additional bandwidth since these channels do not carry any of the data required to create a
16 promotional menu. Instead, when the subscriber selects a channel that does not exist (e.g.,
17 Channel 166), a virtual channel is created using data sent to the set top terminal in a number
18 of ways. For example, the data may be sent in the vertical blanking interval (VBI) of another
19 channel, out-of-band, or with the menu information sent from the headend 208 in the set top
20 terminal control information stream (STTCIS). The data will be used to create graphics stored
21 locally at the set top terminal 220 as an NTSC video signal which may be displayed on the
22 subscriber's television. In this way, a promotional menu may be drawn and a virtual channel
23 is created. This capability simply provides the set top terminal 220 with the ability to display a
24 promotional menu or graphics display whenever a nonexistent channel is selected by the
25 subscriber.

26 f. Other Interactive Services

1 Figures 19a and 19b show menus (1130 and 1132, respectively) that are available
2 using the interactive Level A services. Referring to Figure 19a, when interactive Levels A
3 services are available for a television program, the system will display an interactive logo 1134
4 consisting of the letter "I" and two arrows with semicircular tails. In the preferred embodiment,
5 the set top terminal 220 will place the interactive logo on the television screen as an overlay
6 menu. In the preferred embodiment, the set top terminal 220 will detect that there is data or
7 information available about a television program which can be displayed to a subscriber using
8 the interactive service. When the set top terminal 220 senses that there is interactive
9 information available, it will generate the interactive logo overlay menu 1134 and place it on the
10 television screen. For example, the set top terminal 220 will detect that information on a
11 television program is being sent in the vertical blanking interval (VBI) and generate an
12 interactive logo overlay menu 1134 which will appear on the subscriber's television screen for
13 approximately fifteen seconds during each ten minute interval of programming. Similarly, the
14 set top terminal 220 can sense that the programming has closed caption information available
15 and place a closed caption logo on the screen.

16 Referring to Figure 19b, when the subscriber sees the interactive logo 1134 on the
17 television screen, the subscriber is made aware of the fact that interactive services are available
18 in conjunction with his television program. If the subscriber presses the interactive remote
19 control button, another overlay menu 1133 will be generated by the set top terminal 220 and
20 placed on the screen. This overlay menu 1133 is shown in Figure 19b being overlayed on an
21 interactive television program. From this menu 1133, the subscriber may select a variety of
22 different types of textual interactivity with the current television program, as at 1134, including
23 quizzes, fast facts, more info, where in the world, products, etc. At any time during the
24 interactive submenus, the user may return to the television program without interactive features.

25 Another submenu 1136 gives additional information related to the television program
26 to the viewer in textual form in the lower half of the screen. In Figure 19b, the submenu 1136
27 shows the available interactive options for the subcategory "quiz." In this interactive

1 subcategory, the user is presented with questions and a series of possible answers. If the
2 subscriber desires, the subscriber selects one of the answers to the quiz question. After the
3 selection, the set top terminal 220 sequences to another menu. The set top terminal 220
4 sequences to the interactive quiz answers submenu which informs the subscriber whether the
5 correct answer was or was not chosen. Subsequently, another submenu would show correctly
6 or incorrectly answered quiz question.

7 Figure 20a is an example of a submenu for Level B interactive services. From this
8 menu screen 1141, any of a number of on-line data services could be accessed. One service,
9 the airline reservations selection 1142, has been chosen by the subscriber on this menu.

10 In selecting airline reservations, the subscriber encounters a sequence of menus as for
11 any on-line data service. Referring to Figure 20b, the subscriber is typically shown a submenu,
12 such as submenu 1144, for the data service offering various options. In each of these
13 submenus related to a data service, the subscriber is able to exit, returning to the home menu
14 1010 or regular cable TV.

15 Figure 20b, the airline information and reservation submenu 1144, allows a subscriber
16 to view six available flights. A subscriber may select one of the flights to check on its
17 availability. Another similar submenu allows a subscriber to enter the month, day and year for
18 the availability date desired. In this submenu, the subscriber is offered the option of correcting
19 any errors in the entered information.

20 Figure 20c is another airline submenu 1150 that allows a subscriber to view remaining
21 seats available on a flight, enabling the selection of a seat assignment. This interactive submenu
22 1150 is an example of how information may be graphically shown to a subscriber using a
23 portion of the menu and different coloring schemes. In this interactive menu, the lower half of
24 the screen 1152 shows the passenger compartment of an airplane with all the seat locations
25 graphically represented by square blocks. By coloring the available seat locations in blue and
26 the unavailable seat locations in a different color, the menu can present a great deal of
27 information in a limited amount of space. This graphic presentation of information for the

1 interactive on-line data services is an important method of visually displaying large amounts of
2 information to the subscriber.

3 Referring to Figure 20d, another submenu 1156 allows the subscriber to choose a one-
4 way or round-trip ticket, to confirm reservations and to charge an airline ticket by credit card,
5 choosing the appropriate strip menu on the lower part of the screen. In this particular menu
6 1156, the subscriber is charging a round-trip plane ticket on a credit card. The subscriber
7 simply needs to enter the credit card number, expiration date, and credit card type to charge
8 an airline ticket. Other submenus may process the subscriber's credit card charge for the
9 airline ticket, confirm the subscriber's airline ticket purchase, and pass this information to the
10 location where the ticket is printed.

11 Using the methods and hardware described, a variety of interactive services are
12 possible. Those skilled in the art will recognize that such interactive services may be
13 accommodated by the preferred set top terminal 220.

14 g. Caller ID

15 Using the capability of the set top terminal and a connected modem, the set top terminal
16 is able to perform the function of caller ID. The caller ID function of the set top terminal assists
17 the viewer in a manner similar to the caller ID function provided by telephone companies.
18 However, the set top terminal is able to use the television as its display means to communicate
19 to the viewer information about incoming telephone calls. Also, the strong local processing
20 capability of the set top terminal allows the caller ID function to be much more user friendly and
21 convenient.

22 If the set top terminal senses that a viewer is using the system and watching television,
23 then the caller ID feature would automatically be activated. When the caller ID function is
24 active, the set top terminal software will monitor incoming telephone calls to the viewer through
25 the modem. After the set top terminal senses that the phone is ringing, signals are received on
26 the tip and ring lines of the telephone, the system will immediately look for incoming telephone
27 data identifying the telephone number from which the telephone call was initiated.

1 Upon receiving the telephone number from which the call was initiated, the preferred
2 embodiment of the caller ID compares the telephone number with a list of telephone numbers
3 stored in memory. The list of telephone numbers stored in memory is cross referenced to a list
4 of names, other textual data or graphics. When the set top terminal finds a match between the
5 telephone number and a number stored in memory, the corresponding text or graphics are
6 displayed on the television screen. For example, "GRANDMA" and a "smiley face" graphic
7 can be flashed across the television screen using an overlay menu.

8 In this manner the viewer may see the name (and identifying icon graphics) of the
9 person placing the call and can decide whether to activate an automatic telephone message
10 recording system or answer the telephone call. After generating an overlay menu, the set top
11 terminal software awaits an IR command signifying a viewer response. With the simple
12 depression of a button on the remote control, the viewer can instruct the set top terminal to
13 send an activation signal to the automatic telephone message system (through a set top terminal
14 port). Thus, the viewer can continue to watch a program and know the identity of a caller
15 without taking his or her eyes off the television. If a dumb telephone message system is used,
16 the viewer can simply allow the telephone to ring the requisite number of rings until the
17 telephone answering machine normally activates and answers the call.

18 In an alternative embodiment, having no stored telephone numbers, the set top terminal
19 may just flash the incoming telephone number on the screen using an overlay menu. In a more
20 sophisticated embodiment, a microphone is provided in the set top terminal or remote control
21 unit. Using the television's speakers, a remote control, and a microphone, the viewer is able
22 to answer the telephone using the keys of the remote control without taking his or her eyes off
23 the television screen.

24 h. Digital Audio Capability

25 Referring to Figure 21, the digital audio feature of the invention allows a subscriber to
26 listen to CD quality audio selections through the subscriber's stereo (not shown). This can be
27 accomplished by running cables directly from the set top terminal 220 (which may include a

1 Level D hardware upgrade) to the subscriber's amplifier/stereo system. Alternatively, the
2 subscriber may listen to audio selections through the subscriber's television system.

3 In the preferred embodiment, the digital audio feature uses a Level D hardware
4 upgrade as a digital radio tuner. This Level D hardware upgrade enables a subscriber to use
5 the program delivery system's digital audio signaling capability. Digital audio transmissions
6 require much less bandwidth than that used for the transmission of a digital video signals. Thus,
7 hundreds of digital audio programs are delivered to each set top terminal 220 in limited
8 segments of bandwidth.

9 Where digital audio programs are delivered to the set top terminal 220, the Level D
10 upgrade (shown in Figure 13b) provides the subscriber with the means to select a given digital
11 audio program for listening.

12 The Level D hardware upgrade makes use of a tuner 603 that is separate from the
13 tuner 603 used by the set top terminal 220 for video display. The digital audio signal is
14 received at the set top terminal 220 over the CATV transmission media. The set top terminal
15 220, in turn, routes the digital audio signal to the components of the Level D hardware upgrade.
16 These components may include: a tuner 603, demodulator 606, demultiplexer 609, decryptor,
17 decompressor 622, remote control interface and microprocessor 602.

18 The Level D hardware upgrade will use its tuner 603 to tune to the specific digital audio
19 program selected by the subscriber and subsequently demodulate, demultiplex and decrypt the
20 digital audio signal. Upon completion of this processing, the digital audio signal will be
21 decompressed to produce a processed digital audio signal ready to be output to the
22 subscriber's stereo or directly to speakers.

23 The Level D hardware upgrade includes ports for the digital audio signal output, which
24 provide the necessary connections for transmission of the signal from the Level D hardware
25 upgrade to the subscriber's stereo. In addition, the Level D hardware upgrade include a small
26 LED display that can show the channel number of the program selected, date and time, among
27 other display fields.

1 The Level D hardware upgrade can be physically located in a different room from that
2 of the television and set top terminal 220. Thus, the Level D hardware upgrade will have its
3 own remote control device (not shown), albeit with less available options and keys than the set
4 top terminal's remote control 900 described above. This Level D hardware upgrade remote
5 control is more limited than the set top terminal's remote control 900 since the Level D remote
6 control will be used exclusively for digital audio program selection. This limited remote control,
7 nevertheless, includes a small LED or LCD display that is used to display the channel number
8 of the digital audio program selected. Alternatively, the set top terminal's remote control may
9 be programmed for use with the Level D hardware upgrade so that an additional remote
10 control is not required to use the digital audio feature.

11 Using either remote control embodiment, the subscriber accesses the Level D hardware
12 upgrade to select a digital audio program. The remote control sends an IR command signal to
13 the Level D hardware upgrade, instructing the unit's microprocessor 602 to initiate the selection
14 of a given program. The desired program is processed (i.e., tuned, demultiplexed, decrypted
15 and decompressed) as described above and transmitted to the subscriber's stereo for listening.

16 The selection of a digital audio program does not necessarily require interaction with
17 the subscriber's television. Instead, all communications required to select a digital audio
18 program may occur between a remote control and the Level D hardware upgrade. As a result,
19 the subscriber's television need not be turned on for the digital audio capability to operate.

20 Alternatively, the Level D hardware upgrade can be co-located with the set top
21 terminal 220 and the subscriber can select a digital audio program through a menu displayed
22 on the subscriber's television. In this embodiment, the subscriber would use the set top
23 terminal remote control to access a digital audio program selection menu.

24 In an alternative embodiment, the set top terminal 220 includes all the features of the
25 Level D upgrade and, therefore, no upgrade is necessary. Those skilled in the art will recognize
26 other alternatives that allow digital audio reception.

1 Figure 21 is a major menu 1160 displaying the digital audio program choices which are
2 available for subscribers who have paid the monthly fee. In a chart format 1162, the major
3 menu shows the top five, ten, and forty songs available in six different categories of music.
4 Below the chart, the system is able to provide a text message 1164 describing the particulars
5 of the audio program selected. Using the same logos and menu format, the system can provide
6 a text description enticing the subscriber to pay the monthly fee and join the service. For
7 example, one menu may allow the user to test the system with a free demonstration. Another
8 menu allows the subscriber to request additional promotional information about the system.
9 Such menus may be used throughout the menu system.

10 From any of the menu screens for the digital audio feature, the subscriber may return
11 to regular cable TV with the press of a single button.

12 i. VCR Control

13 Referring to Figure 22, the advanced system of the set top terminal 220 is used to
14 control video tape machines and simplify recording programs using a Guide Record feature.
15 The set top terminal 220 has a separate output 650 for a VCR. Control signals are transmitted
16 through the VCR output of the set top terminal 220 and input to the VCR to allow the VCR
17 to be automatically controlled by the set top terminal 220. Using the set top terminal 220,
18 certain programs are selected by a subscriber from menus, and the VCR will be automatically
19 activated to record the selected program.

20 In order to accommodate the VCR control feature, the set top terminal 220 sends
21 instructions or control signals to the VCR. Such control signals are initiated by the set top
22 terminal's microprocessor 602 and passed to the VCR either using a separate connection or
23 as part of the video signals processed for display on the subscriber's television. These control
24 signals are sent directly from the advanced set top terminal 220 to the VCR, instructing the
25 VCR when to begin and end taping of a particular program.

26 The microprocessor 602 coordinates the dissemination of control signals sent to the
27 VCR, storing the content of such signals in local memory. Upon nearing the time for the

1 program to be displayed, the microprocessor 602 activates the menu generation software to
2 display a notification menu or screen, notifying the subscriber that the program is nearing the
3 time for display. This reminder will also request the subscriber to check whether a tape has
4 been inserted into the VCR itself.

5 The subscriber can initiate the VCR control feature by accessing a VCR control
6 submenu, which requests whether the subscriber wishes to record a program selected for future
7 viewing. In this way the subscriber interactively enters such information on the menu screen or
8 display using any of the hardware described above that accommodates subscriber interactive
9 response capabilities.

10 In the preferred embodiment, the subscriber will use a movie library in conjunction with
11 his VCR or other video taping machinery. The movie library is a menu selectable list of
12 available movies. In that way, a subscriber may tape movies which are shown at inconvenient
13 start times for later viewing. By enabling the proper features of the set top terminal 220, a
14 subscriber can have the terminal activate the television and the VCR and perform all the
15 functions necessary to tape a movie.

16 After the VCR control feature is initiated, a menu screen confirms the movie selection,
17 start date and start time and informs the subscriber that the VCR will be automatically turned
18 on. During this submenu, the user may return to the movie library major menu, or regular TV
19 or cancel the movie library order by pressing the escape button. This menu shows that the
20 subscriber has chosen to return to regular TV. The subscriber's VCR or other video taping
21 equipment must be connected to the set top terminal 220 for the automatic taping feature to
22 operate.

23 Following a program choice, a program description submenu is placed on the television
24 screen. In addition, from this program description submenu, the viewer may choose to record
25 the selected program on his VCR using the guide record feature. If the guide record feature
26 is chosen, the guide record submenu 1170 shown in Figure 22 provides the subscriber with
27 further instructions. In order for the set top terminal 220 to perform the guide record functions

1 and operate the VCR, control signals are sent from the set top terminal 220 to the VCR via the
2 video connection 650 or through a separate connection between the set top terminal 220 and
3 the VCR. The VCR is capable of interpreting these control signals from the set top terminal
4 220 and performing the desired function (such as, activating the record feature). In the
5 preferred embodiment, the VCR control signals are sent with the video signal and output from
6 the output 650, as described above. Alternatively, a separate connection between the set top
7 terminal 220 and VCR may be used.

8 j. HDTV Capability

9 The set top terminal 220 and program delivery system of the preferred embodiment can
10 easily support high definition television (HDTV). The combination of digital video, compression
11 and no restricted bandwidth limitation per channel makes the preferred system ideal for HDTV.
12 The greater information flow of HDTV causes no problems for the system. The menu selection
13 system of the preferred embodiment is a user friendly manner of presenting HDTV
14 programming to the subscriber.

15 Figure 23 shows the integration of HDTV services into the menu-driven program
16 delivery system. If the subscriber selects the major menu for HDTV 1032, the subscriber will
17 receive either a description of the service with a suggestion to order the system, or a text note
18 that the subscription is current and a listing of the currently available program selections in
19 HDTV. If the subscriber has not paid to join the particular service, HDTV, the subscriber may
20 be allowed to join one of the programs in progress for a limited time as a demo to entice the
21 subscriber to order.

22 If a subscriber has paid the HDTV fees, the subscriber proceeds as in any other major
23 menu screen. This particular major menu shows an example of how a follow-on or second
24 screen may exist for the same menu. In this particular case, a second screen exists for the
25 major menu HDTV 1032. The subscriber may access the second screen by selecting the last
26 menu display block 1172 "Other HDTV Selections" in the lower part of the screen. Following
27 this selection, the subscriber will be given a second screen of program selections. In this

1 manner, any menu can have multiple screens with many program choices. This type of screen
2 pagination on one menu allows the operations center 202 packager to avoid categorizing
3 program selections within that same menu. In an alternative embodiment, the options available
4 to the subscriber may be scrolled on one menu screen with the text within the menu display
5 blocks changing as the subscriber scrolls up or scrolls down. Many variations of this HDTV
6 example can be used with the described system.

7 k. Backyard System

8 In an alternative configuration, in areas without cable services where subscribers use
9 backyard satellite systems (TV RO) to receive packaged television services, the set top
10 terminal 220 will include the appropriate hardware to allow connection to the satellite 206
11 reception equipment through port 656. In this configuration, the menu system within the set top
12 terminal 220 will be programmed directly from the operations center 202. Additionally, an
13 upstream communication mechanism must be in place at the subscriber's home (i.e. modem)
14 to communicate information to the operations center.

15 The hardware components that allow the set top terminal 220 to operate in a backyard
16 system typically will not be included within the set top terminal shell itself. Instead, any such
17 components accommodating the set top terminal's interoperability with a backyard program
18 delivery system will typically reside outside the subscriber's home. As a result, the set top
19 terminal 220 will operate as described above, notwithstanding any change in program delivery
20 transmission media.

21 l. Automatic Program Pause Feature

22 An apparatus and method consistent with the present invention provides for
23 automatically pausing of a video program in response to detection of an occurrence of a
24 communications event or related triggering event. The term "communications event" includes
25 any communication of information through any wireline or wireless medium, examples of which
26 are provided below. The term "triggering event" includes a user's access to a communications
27 event, examples of which are provided below. During the pausing, the video program is

1 buffered such that a user may replay portions of it and perform other VCR-type functions of
2 the program. In addition, the apparatus and method provide an indication of the
3 communications event to the user by displaying, for example, text or graphics on a video
4 display for the video program. For example, based upon detection of an incoming telephone
5 call, the apparatus pauses the video program and displays an indication of the call overlaid
6 on the paused video program or inset within it. This feature thus permits a user to automatically
7 obtain an indication of a particular event while, at the same time, having the video program
8 buffered such that portions of it are not missed, which is particularly useful for "live" video
9 programs.

10 Figures 24a-24d provide examples of indications of various communications events
11 which may be used to pause a video program. As shown in Figure 24a, a video display 1400
12 displays a video program 1401. Based upon detection of a telephone call, the system displays
13 a message 1402, which may include the incoming telephone number as well as any text or
14 graphics the user has previously associated with that number. For example, as shown, a user
15 may associate a name with a particular number and potentially also associate an icon with it
16 such as a "smiley face." The video display 1400 may be implemented with a television 222 or
17 any device for displaying a video program, such as a computer monitor or flat screen display.
18 Also, the indication of the communications event may be presented on the same display device
19 as the paused video program, or on an associated display device.

20 As shown in Figure 24b, detection of an incoming e-mail message may result in a text
21 message 1403 providing an indication of the incoming e-mail message. This indication can
22 include the message itself or other identifying information, such as a graphic or an identification
23 of the sender of the message.

24 As shown in Figure 24c, detection of a message from program control may result in
25 display of a message 1404. Program control refers to a particular content provider. For
26 example, program control includes a cable television operator, a set top terminal manufacturer,
27 or a cable television network programmer.

As shown in Figure 24d, detection of an incoming web page may result in display of a web page 1405. Web pages includes pages formatted, for example, in HyperText Markup Language (HTML) for transmission over the Internet using web browsers. Also, a user's access to the web page may constitute a triggering event, resulting in pausing and buffering of the video program. Many other types of triggering events are possible, involving a user's access to other types of communications events. Examples of other communications events include, but are not limited to, the following: a page to a pager number; an incoming cell phone call; an incoming facsimile transmission; an indication of a voice mail; or an incoming video call. Likewise, examples of other triggering events include, but are not limited to, the following: a user's access to a page to a pager number; a user answering an incoming cell phone call; a user accessing or otherwise requesting to view an incoming facsimile transmission; a user's access to a pending voice mail message; a user's access to his or her personal web page; or a user's initiation of a video call.

This program pause feature provides the user with an indication of a particular communications event, while buffering the paused video program. The user can thus take a particular action in response to the communications event without missing any substantial portion of the video program. For example, in response to display of an indication of an incoming telephone call, the user may choose to answer the telephone call while the video program is buffered. The system can buffer the video program either, for example, in response to the telephone call or in response to an off-hook condition indicating the user has answered the call. Likewise, in response to an e-mail message or message from program control, the user may choose to view the message while the paused video program continues to be buffered. The incoming e-mail and web pages may be related to user options; for example, a particular stock price may be used to automatically trigger an e-mail or web page transmission to the user's display device.

Figures 25 and 26 illustrate how use of the buffer for a video program permits the user to replay portions of the video program and execute other VCR-type functions for it. This

1 feature is particularly useful for real-time ("live") video program transmission, where the user
2 typically would otherwise lose portions of the transmission when the video program is paused.
3 This feature may be used with any type of video program, whether transmitted, for example,
4 in real-time or prerecorded. The buffer receives and stores the video program for subsequent
5 playback. Various techniques are known for converting a video program into a digital signal,
6 potentially compressing it, and storing it onto a storage device for subsequent replay. The
7 buffer may be implemented with a storage device such as a hard disk drive or the RAM
8 controlled by set top terminal 220, as shown in Figure 4. Alternatively, the buffer can be
9 implemented with a storage device at cable headend 208 or with any type of storage device
10 receiving a video program for display on an associated display device.

11 As shown in Figure 25, a buffer 1420 receives a video signal from a video program
12 source 1423, which includes any source of a video signal for use in displaying a video program.
13 Examples include broadcast television, and other wireless and cable television transmission, and
14 electronic devices outputting video signals. The video signal is typically processed for storage
15 within buffer 1420, such as through conversion to a digital signal, compression, and filtering.
16 Buffer point 1422 in buffer 1420 illustrates a point of current transmission. In other words, a
17 beginning of the buffer corresponds with a current transmission of a video program from video
18 program source 1423. The video program is transmitted from the buffer to a video program
19 display 1424.

20 Upon reading the video signal from buffer 1420, various processing of it may occur for
21 subsequent display on a television or other display device. For example, the stored video signal
22 is typically converted to an analog signal, amplified, and filtered before transmission to the
23 display device. A transmission point 1425 illustrates a point of transmission of the video
24 program from buffer 1420 to display 1424. Therefore, when the system transmits the video
25 program from the start of the buffer, with transmission point 1425 corresponding to the point
26 of current transmission 1422, the video program is transmitted in real-time.

1 Although transmitted in real-time, the apparatus simultaneously buffers the incoming
2 video signal for subsequent use in performing various video program control features.
3 Therefore, buffer point 1421 illustrates the amount of the video program stored within buffer
4 1420. With various types of storage devices such as hard disk drives along with known
5 compression technology, it is possible to buffer a substantial amount of a video program.

6 Figure 26 illustrates use of the buffer for performing various video control functions,
7 particularly after the video program has been paused. As the video program is paused, buffer
8 point 1425 moves along buffer 1420 to track the last point of transmission of the video
9 program. When the video program is paused, the user may execute various functions to
10 continue to play the video program and play portions that were missed. Therefore, the amount
11 of video buffered between point 1421 and buffer point 1425 represents an amount buffered
12 before the video program was paused. The amount buffered between buffer point 1425 and
13 point of current transmission 1422 represents the amount of video program missed by the user
14 and buffered while the video program was paused. Upon requesting to play the video
15 program, buffer point 1425 moves toward the beginning of buffer 1422 in order to play a
16 buffered portion that was missed.

17 Since the video program has been buffered, the user may perform other functions. In
18 particular, the user may rewind the video program, in which case buffer point 1425 moves in
19 rewind direction 1427 to play previous portions of the video program. The user may fast
20 forward the video program, in which case buffer point 1425 moves in fast forward direction
21 1426 toward the point of current transmission 1422 as the buffered video program is
22 transmitted to display 1424. Accordingly, by transmitting the video program from various
23 points along the buffered portion of the video program in buffer 1420, the user may perform
24 VCR-type functions of real-time or other video programs. Various other buffering
25 methodologies may also be used with the program pause feature.

26 Figure 27 is a flow chart of a program caller ID method 1430 for programming a caller
27 ID function. As also explained above, caller ID uses known technology for displaying on a

1 telephone or associated device a caller's phone number for an incoming phone call. The caller
2 ID function permits pausing of a video program to display an indication of an incoming
3 telephone call. Program caller ID method 1430 permits a user to associate text messages and
4 potentially graphical information with telephone numbers. Therefore, when a caller ID function
5 displays the telephone number of an incoming telephone call, the system may also retrieve and
6 display a name or other information associated with that number. Program caller ID method
7 1430 may be implemented in software or firmware, including modules, for execution by
8 microprocessor 602 in set top terminal 220; alternatively, it may be implemented with other
9 processor-controlled devices for use in displaying a video program on an associated display
10 device. As used herein, the term "module" includes a single module, multiple modules and one
11 or more modules each having one or more sub-modules.

12 In program caller ID method 1430, a user requests to program caller ID (step 1431),
13 which may occur through the use of an input device such as a keyboard or remote control 900.
14 The system receives a phone number from the user (step 1432), which the user may enter
15 through use of remote control 900 or other input device. The user then enters a text message
16 through use of remote control 900 or other input device (step 1433). In addition, the system
17 may permit a user to select a graphic or other icon to also associate with the phone number
18 (step 1434), an example of which is shown in Figure 24a. The system can prestore various
19 graphics or icons and display them to the user for selection through remote control 900 or other
20 input device. In response to the user's request to save the information, the system associates
21 the phone number with the text message and graphic and stores it for later retrieval (step 1435).
22 The information may be stored in the RAM accessed by microprocessor 602. If the user
23 requests to program more telephone numbers (step 1436), the system repeats steps 1432-
24 1435. Certain numbers can be programmed to automatically pause the video program while
25 others will need an additional step for pausing the video program.

26 Figure 28 is a flow chart of an event monitoring method 1440 for monitoring
27 communications events and pausing a video program in response to detection of an occurrence

1 of a communications event or triggering event. Event monitoring method 1440 may be
2 implemented in software or firmware, including modules, for execution by microprocessor 602
3 in set top terminal 220; alternatively, it may be implemented with other processor-controlled
4 devices for use in displaying a video program on an associated display device.

5 In event monitoring method 1440, the system monitors an on-line connection (step
6 1441). This typically occurs at set top terminal 220, which may include a connection with a
7 phone line through telephone jack 658 in addition to a connection to a source of a cable
8 television signal, a satellite television signal, or other sources of video programs such as those
9 described above or in the related applications identified above. The system continually
10 monitors the connection for an occurrence of a communications event (step 1442). Upon
11 detecting the occurrence of a communications event, the system optionally automatically pauses
12 the video program in response to the communications event and continues to transmit it to the
13 buffer for storage (step 1443). Step 1443 is optional in that a user may choose to have the
14 video program paused in response to a triggering event, explained below, rather than in
15 response to a communications event.

16 The system also determines if stored information exists corresponding to the
17 communications event (step 1444). For example, the user may have stored text information
18 corresponding to particular phone numbers using program caller ID method 1430. If
19 information corresponding to the communications event exists, the system retrieves the stored
20 information (step 1445).

21 The system then displays an indication of the communications event (step 1446). This
22 indication is typically displayed on the same television or display device which displays the
23 video program. It may be displayed as an overlaid image on the displayed or paused video
24 program or an inset image within the displayed or paused video program, as shown in Figures
25 24a-24d. If the communications event was a telephone call (step 1447), the system displays
26 the number of the incoming telephone call or another indication of the call along with any
27 retrieved information, if present (step 1452). The system may, for example, detect occurrence

1 of a telephone call through monitoring a phone line through telephone jack 658 and detecting
2 a signal corresponding to a phone call.

3 If the event was an incoming e-mail message (step 1448), the system displays an
4 indication of the e-mail message such as the name of the sender (step 1453). The system may
5 detect an e-mail message through use of e-mail communications software detecting an incoming
6 e-mail on a phone line through telephone jack 658. Software packages for sending and
7 receiving e-mail messages are known in the art.

8 If the communications event was an incoming web page (step 1449), the system
9 displays an indication of the web page such as the page itself (step 1454). The system may
10 detect an incoming web page, for example, through use of a web browser in set top terminal
11 220 detecting receipt of a web page on a phone line through telephone jack 658. Web
12 browsers are known in art and include, for example, the MICROSOFT INTERNET
13 EXPLORER (TM) program and the NETSCAPE NAVIGATOR (TM) program.

14 If the communications event was an incoming message (step 1450), the system displays
15 an indication of the message such as an identification of the sender of the message (step 1455).
16 The system may detect an incoming message in the same manner as detection of an e-mail
17 message.

18 If another type of communications event occurred (step 1451), such as receipt of an
19 incoming video call, the system may display an indication of that type of communications event
20 (step 1456). For any of the communications events, the system may alternatively display an
21 icon, such as a telephone icon for a phone call or an envelope icon for an e-mail message, or
22 display textual or other information providing an indication of the communications event. This
23 display may be in the form of an overlay menu or a hidden menu. Alternatively, techniques such
24 as picture-in-picture, split screen, or side-by-side screen displays may be used. After
25 displaying an indication of the communications event, the system waits for user input (step
26 1457).

1 The system receives a particular user input (step 1458) and determines if it is a
2 triggering event, which is a user's access to a communications event. For example, triggering
3 events include a user answering a phone call, opening or selecting a displayed indication of an
4 e-mail or web page, or one of the other examples provided above. Therefore, instead of
5 having the video program automatically paused in response to the communications event, a user
6 can continue to view the video program upon viewing an indication of a communications event
7 and have the video program paused if the user decides to access the communications event.
8 The indications of the communications events may be displayed overlayed on the video
9 program, or inset within it, for that purpose. In addition, if no triggering event occurs within a
10 particular time, the system can be programmed to automatically remove the indication of the
11 communications event. Therefore, if the user does not access the communications event within
12 a particular time frame, the system does not continue to display the indication of a
13 communications event over the video program. The system may also be programmed for other
14 types of options and examples include, but are not limited to, the following actions by the
15 system based upon detection of a communications event or a triggering event: muting an audio
16 portion of a video program, continue displaying a video portion of the video program, and
17 buffering both the video and audio portions for future replay; or pausing a video portion of a
18 video program, continue presenting an audio portion of the video program, and buffering both
19 the video and audio portions for future replay.

20 The system determines if the user input is a triggering event (step 1459). For example,
21 it may detect a phone off-hook condition, a user's initiation of a video call or a user's selection
22 of an e-mail or web page through, for example, use of remote control 900. Alternatively, the
23 television system may be equipped to allow the user to answer the phone using the remote
24 control 900. If the user input is a triggering event, the system determines if the program is
25 already paused (step 1460); if not, the system automatically pauses the program in response
26 to the triggering event and transmits the video program to the buffer for storage (step 1461).
27 As explained above, the pausing may include pausing both the video and audio portions of a

1 video program, pausing only the audio portion, or pausing only the video portion. Typically,
2 both the audio and video portions are buffered during the pausing.

3 If the user input was not a triggering event, the system determines if it was a user
4 command (step 1464); if so, the system executes the user command (1465), as described in
5 video program control method 1470 shown in Figure 29. As indicated, the system may also
6 be programmed to remove the indication of the communications event if it does not detect a
7 triggering event within a particular time frame. Therefore, the system may determine if a
8 particular time has elapsed without receiving a triggering event (step 1462) and, if so, it
9 removes the indication of the corresponding communications event (step 1463). For example,
10 any overlayed items or text may be removed.

11 Figure 29 illustrates video program control method 1470, which may be executed
12 simultaneously with event monitoring method 1440. Video program control method 1470
13 permits VCR-type functions based upon use of the buffer as explained with respect to Figures
14 25 and 26. In addition, video program control method 1470 permits the user to enter a
15 command in step 1457 in the flow chart in Figure 28 in order to begin playing a video program
16 after it has been paused in response to detection of an occurrence of a communications event.
17 The user may also enter these commands at various other times during the viewing of a video
18 program. Video program control method 1470 may be implemented in software or firmware,
19 including modules, for execution by microprocessor 602 in set top terminal 220; alternatively,
20 it may be implemented with other processor-controlled devices for use in displaying a video
21 program on an associated display device.

22 In video program control method 1470, the system receives a user command (step
23 1471). The user may enter commands through use of remote control 900 or other input
24 device. If the user entered a play command (step 1472), the system receives and displays a
25 video program and simultaneously buffers the program; the system also removes an indication
26 of a communications event from the display device, if present (step 1480). Therefore, if a
27 program had been paused in response to detection of an occurrence of a communications event

1 in event monitoring method 1440, the system removes the displayed indication and begins
2 playing the video program from buffer point 1425 such that the user would not have missed any
3 substantial portion of the video program.

4 If the user entered a pause command (step 1473), the system determines that the video
5 program is already paused (step 1481). If the program is paused, the system begins playing
6 the program again from the buffer at buffer point 1425 (step 1482). If the program was not
7 paused, the system pauses the video program and continues to transmit it to the buffer for
8 storage (step 1483). Therefore, the pause function operates to pause the program and, upon
9 selection of pause again, begin playing the video program at the point where it was paused.

10 If the user selected a rewind command (step 1474), the system transmits the video
11 program in rewind direction 1427 from the buffer (step 1484). The system also determines
12 during the rewind if it has reached the end of the buffer at point 1421 (step 1485). Once the
13 system reaches the end of the buffer, it waits for another user command as it cannot further
14 rewind the video program. If the user entered a fast forward command (step 1475), the system
15 determines if the program is transmitted at the current point of transmission 1422 (step 1486).
16 If the program is already transmitted at its current point of transmission, the system cannot fast
17 forward beyond that point and waits for another user command. Otherwise, the system
18 transmits the program in fast forward direction 1426 from the buffer (step 1487), and continues
19 fast forwarding the video program until it reaches the current point of transmission as
20 determined in step 1486.

21 If the user entered a jump command (step 1476), the system determines if the program
22 is transmitted at current point of transmission 1422 (step 1488); if not, it jumps to the start of
23 the buffer such that buffer point 1425 corresponds with the point of current transmission 1422
24 and plays the program from that point (step 1489). If the user entered a slow motion command
25 (step 1477), the system transmits the program from the buffer at a reduced rate, which may be
26 predetermined or entered by the user (step 1490).

1 If the user entered a frame forward command (step 1478), the system determines if the
2 program is paused (step 1491). In this example, the system only executes the frame forward
3 command after the program has first been paused. If the program is paused, the system
4 transmits the program frame-by-frame in a forward direction from the buffer (step 1492). The
5 forward direction corresponds with fast forward direction 1426. If the user entered a frame
6 back command (step 1479), the system again determines if the program is paused (step 1493),
7 since in this example the system only performs the frame back command if the program is first
8 paused. If the program is paused, the system transmits the video program frame-by-frame in
9 a reverse direction from the buffer (step 1494). The reverse direction corresponds with rewind
10 direction 1427.

11 m. Video Call Feature

12 i. Basic Video Call Functionality

13 A preferred form of the present invention provides video calling capability in the set top
14 terminal 220. To support video calling, the set top terminal 220 is augmented with additional
15 features, as shown in Figure 30. The additional features can be integrated into an enhanced set
16 top terminal 220 or provided as one or more upgrades to a more basic set top terminal 220.
17 In Figure 30, a camera 2000 and an input device 704 are included in the set top terminal 220.
18 The camera 2000 is preferably a small video camera located and oriented on the set top
19 terminal 220 so that it is typically directed at the face, torso, or entire body of one viewing the
20 display 602. The direction of pointing is preferably manually adjustable by the user.
21 Alternatively or additionally, the camera 2000 can be pointed, focused and otherwise
22 controlled electronically.

23 The input device 704 performs the function of accepting user input in order to establish
24 and manage a video call, e.g., entering party identifiers, hanging up, etc. The input device 704
25 may be a physical joined with the set top terminal 220 or apart from the set top terminal 220.
26 Exemplary forms of the input device 704 include a telephone style number key pad;
27 cursor/pointer movement device, such as a track ball, joystick or touch pad; click-type buttons;

1 and a wired or wireless interface to a separate keyboard. Alternatively or additionally, the
2 display 222 and the input device 704 can be combined in the form of a touchscreen. The input
3 device 704 may be a combinations of several different forms, including the illustrative ones just
4 mentioned. In a preferred embodiment, the input device 704 is the remote control 900.

5 Video calling also requires an upstream (or reverse path or transmission)
6 communication capability of sufficient bandwidth. The upstream communication capability for
7 video calling is in addition to the downstream communication capability by which broadcast
8 programming is received. The communications network that provides this bidirectional
9 bandwidth is described in detail further below.

10 To support video calling, an instruction memory of the set top terminal 220 preferably
11 contains programs for call establishment and management. The programs provide menus and
12 a graphical user interface for call initiation, adding a party to a conference call, accepting an
13 incoming call, terminating a call, and setting up call characteristics as well as display and other
14 output characteristics.

15 Figure 30 is a block diagram of video call transmission and reception functions of the
16 set top terminal 220. In regards to transmission, a video signal from the camera 2000 is
17 subjected to source encoding (i.e., conversion to spectrally efficient or compressed digital form)
18 by a video source encoder 705, and an audio signal from the speaker/microphone 2002 is
19 subjected to source encoding by an audio source encoder 710. The source encoded video and
20 audio signals are synchronized and multiplexed together by a synchronizer multiplexer 715. The
21 video source encoder 705, audio source encoder 710 and the synchronizer multiplexer 715
22 together can function to perform standard audio/visual encoding algorithms such as MPEG
23 (motion picture expert group) or ITU standard H.261 or H.263, which are well known in the
24 art. Other media signals, signals containing signaling information or data signals from a data
25 source 712 can also be multiplexed with the audio and video signals, as described in greater
26 detail below. The multiplexed audio/visual signal output from the synchronizer multiplexer 715
27 is optionally encrypted by an encryptor 720 and channel encoded (e.g., forward error

1 correction encoding and/or interleaving) by a channel encoder 725 before being transmitted
2 by a transmitter 730 upstream into a video conferencing connection network. Those skilled in
3 the art will appreciate that the transmission functions illustrated in Figure 30 can be implemented
4 in an order different from that illustrated.

5 In regards to reception, an incoming (i.e., downstream) video conferencing signal is
6 received by a receiver 750, decoded by a channel decoder 755, decrypted by a decryptor
7 760, and demultiplexed with proper relative timing among video, audio and other data
8 components by a demultiplexer synchronizer 765. Video signals are decompressed by a video
9 source decoder 770 and output for display on a display device 602, which is typically the
10 television 222. Audio signals are decompressed by an audio source decoder 775 and output
11 for playing on the speaker/microphone 2002, the speaker portion of which may be the
12 speaker(s) of the television 222. Data files, such as electronic books, are stored in one or more
13 files 777. Again, the order of processing can be different from that illustrated.

14 The other signals that can be multiplexed with the audio and video conference call
15 signals include, for example, data files, electronic books, or HTML (hyper-text markup
16 language) based content according to the ATVEF (advanced television enhancement forum)
17 specification. The HTML content may be displayed, may be stored in the set top terminal 220
18 for later use, or may be passed to other devices. Broadcast data triggers, announcements, and
19 content resources can be sent in the VBI of the video call signal or in an auxiliary data channel
20 delivered with the video call signal. Announcements can be used to indicate that interactive
21 programming content is available for a given video call or segment of a video call. Content
22 resources contain the actual content or programming to be run on the receiving device. Such
23 content includes Web pages, scripts and images. The broadcast data trigger is used to
24 synchronize the initiation of the interactive programming content to an ongoing video conference
25 call.

26 ii. Network for Video Calling

1 Figure 31 illustrates a video conferencing network 1000 and various configurations for
2 connecting set top terminals 220 (or other video conferencing end equipment 1005) to the
3 network 1000. The network 1000 provides full duplex interconnectivity between set top
4 terminals 220 involved in a given video conference call. The network 1000 can support many
5 simultaneous calls. One typical configuration for connecting a set top terminal 220 to the
6 network 1000 is via a local switch 262, such as shown in the lower central area of Figure 7,
7 where a set top terminal 220a is connected to a local switch 262a, which in turn is connected
8 to the network 1000. A variation of this configuration is a direct connection between the
9 network 1000 and a set top terminal 220, such as the set top terminals 220b-220d.

10 Figure 31 also illustrates a mini-network 1010. The mini-network 1010 can provide
11 full duplex interconnectivity between set top terminals 220 in a limited area (e.g., within a home,
12 building, or campus) so as to support video calls without involvement of the network 1000.
13 For example, in the case of a video call between two set top terminals 220e and 220f within
14 the mini-network 1010, the connection between the set top terminals 220e and 220f can be
15 a direct connection or it can be a connection through the local switch 262b. Figures 11 and
16 12 further illustrate these two connection options, respectively.

17 In Figure 32, the set top terminals 220e and 220f, as well as a third set top terminal
18 220g, communicate with each other without an intermediary. The communication paths
19 between the set top terminals 220e-220g are preferably wireless links, and in one embodiment
20 the wireless links are RF links that utilize an RF transceiver in each of the set top terminals
21 220e-220g. Wireless infrared links are also possible. In alternate embodiments, the
22 communication paths can be provided by wired networks, such as an existing data or computer
23 network (e.g., LAN), existing television cabling, or existing home/building power wiring (as
24 disclosed, for example, in U.S. Patent No. 5,319,634, which is hereby incorporated by
25 reference). In any case, the channel linking the set top terminals 220e-220g is multiplexed to
26 accommodate six unidirectional links that connect the three set top terminals 220e-220g in a
27 fully meshed network. Although one skilled in the art will readily appreciate that many

1 multiplexing schemes are possible, including TDMA (time division multiple access) and FDMA
2 (frequency division multiple access), the multiplexing scheme preferably utilizes CDMA (code
3 division multiple access), also termed SSMA (spread spectrum multiple access), techniques.
4 Advantages of CDMA in this instance include security of transmissions and the fact that FCC
5 (Federal Communication Commission) regulations might not apply to these transmissions.

6 In one embodiment, an asynchronous direct sequence CDMA system with a common
7 spreading code is utilized. Similar CDMA systems are well known and discussed, for example,
8 in U.S. Patent No. 5,103,459 and U.S. Patent No. 5,546,381, both of which are hereby
9 incorporated by reference. In such a system, a transceiver of each of the set top terminals
10 220e-220g includes an omnidirectional or essentially omnidirectional antenna, so that each set
11 top terminals 220e-220g can receive the transmission of the other two set top terminals. Each
12 of the set top terminals 220e-220g encodes its transmissions using the same m-sequence as a
13 direct sequence spreading code but at different phases. For example, the set top terminals
14 220e may transmit at a relative code phase of zero; the set top terminals 220f may transmit at
15 a relative code phase of -3.2 chips; and the set top terminals 220g may transmit at a relative
16 code phase of +38.0 chips. Actually, each of the set top terminals 220e-220g can transmit at
17 a random code phase while the receiver circuitry includes a search/selection algorithm as well
18 as some contention protocol to resolve code phase collisions. The transceiver of each of the
19 set top terminals 220e-220g in this embodiment is a CDMA receiver that suppresses self-
20 reception interference, despreads the received signals at the various incoming codes phases,
21 tracks those phases, and possibly mitigates multipath and/or interuser interference.

22 Because the mini-network 1010 of Figure 32 is fully meshed, it can operate under
23 distributed control. Preferably, a receiver-oriented control protocol is utilized. Each of the set
24 top terminals 220 participating in a video conference call broadcasts its audio/video signal(s),
25 and any set top terminals 220 that receives the signal(s) performs the necessary processing to
26 output the audio and video components in combination with those of other received signal(s).
27 Preferably, the video portions of the incoming signals are scaled and displayed together in some

1 arrangement on the display 602, while the audio portions of the incoming signals are summed,
2 synchronized to the video, if necessary, so that a summed, synchronized audio signal is sounded
3 from the speaker/microphone 2002.

4 In Figure 33, the local switch 262c is used as a central node in the mini-network 1010,
5 and connections 1200-1210 link the local switch 262c to the set top terminals 220e-220g,
6 respectively. The connections 1200-1210 can be hardwired or wireless. Although Figure 33
7 depicts the connections 1200-1210 in a star arrangement, other arrangements, such as a ring,
8 for example, are possible. In cases where the connections 1200-1210 share a common
9 medium (e.g., a hardwired ring, or free space in the case of wireless connections), then a
10 multiplexing scheme is necessary. Again, many well known multiplexing schemes are possible,
11 including TDMA and FDMA, but the multiplexing scheme preferably utilizes CDMA
12 techniques for wireless connections. In this case, the centralized node (i.e., the local switch
13 262c) allows a synchronous, orthogonal CDMA system to be utilized.

14 Specifically, synchronous orthogonal CDMA spreading codes, such as Walsh-
15 Hadamard codes, are employed on the uplinks from each of the set top terminals 220e-220g
16 to the library unit 262c; meanwhile, a broadcast downlink is transmitted from the local switch
17 262c and received by each of the set top terminals 220e-220g. In one embodiment, the
18 broadcast downlink is spread using one of the Walsh-Hadamard codes unused by the uplinks
19 and includes control data for uplink timing and transmission power control feedback as well as
20 call data comprising combined audio/video signal(s) from each viewer participating in the
21 conference call.

22 In one embodiment, the local switch 262c provides centralized control of
23 communications involved in a video conference call. Such centralized control may include call
24 set-up, audio summing, and video combining. Alternatively, the local switch 262c can perform
25 only switching and connectivity functions, while each of the set top terminals 220e-220g
26 performs the control functions, just like in the case of a directly connected mini-network where
27 there is no local switch 262.

1 The access control of the local switch 262c can be modified to accommodate multiple
2 viewer connections during a conference call. The local switch 262c may communicate with
3 several set top terminals 220e-220g during a conference call. This can be accomplished by
4 operating the local switch 262c in a “clear” mode during a conference call. Clear mode
5 transmissions from the local switch 262c may be unencrypted or, preferably, clear mode
6 transmissions from the local switch 262c utilize a common key to which all of the set top
7 terminals 220e-220g have access.

8 The mini-network just described is capable of supporting calls between set top
9 terminals 220 in a relatively small geographical area, without involvement of the network 1000.
10 For calls of greater range, the network 1000 is necessary. National or worldwide connectivity
11 is possible using the network 1000, which may take various forms, as described below,
12 including hybrids of the following: cable television network, cellular telephony network, PCS
13 network, the PSTN and the Internet.

14 In one embodiment, the network 1000 utilizes a cable television transmission network,
15 as described in section A above. Generally, a cable television transmission network comprises
16 headends, each of which serves a number of subscribers. The connection between a headend
17 and a subscriber may be metallic coaxial cable, optical fiber, or a hybrid, e.g., hybrid fiber-coax
18 (HFC) systems. The most common cable networks today are HFC networks, but 100% fiber
19 optic networks, i.e., fiber to the curb (FTTC), will be more prevalent in the future.

20 To support conference calling, the cable television network and the home interface to
21 the cable network must support two-way communications. This can be accomplished by
22 having separate physical fibers/cables or directional multiplexing on the same fibers/cables or
23 some combination of both. For example, the frequency range between 5 MHZ and 42 MHZ
24 is allocated for upstream (also called “uplink”) transmissions (i.e., from a subscriber to a
25 headend). In a typical HFC layout, there are separate optical fibers for upstream and
26 downstream transmissions between a headend and each of several neighborhood fiber nodes,
27 where signals are converted between optical and electrical forms. However, upstream and

1 downstream transmissions are multiplexed together onto the same coaxial cable that links a
2 fiber node to subscriber sites (e.g., homes, offices). Bidirectional amplifiers employing
3 diplexers are typically utilized in the coaxial portion between a fiber node and subscriber sites.
4 Further details of a bidirectional cable television system are contained in U.S. Application Serial
5 No. 09/124,043, filed July 29, 1998, entitled METHOD AND APPARATUS FOR USING
6 PROGRAMS WATCHED DATA, which is hereby incorporated by reference. An alternative
7 use of the cable plant is via cable modem pairs between a viewer or library unit and a headend.

8 Further upstream from the cable headends are one or more operations centers. The
9 general downstream functionality of an operations center is collecting programs and/or data,
10 packaging the collected programs and/or data, and transmitting the packaged programs and/or
11 data to headends. The link between an operations center and a headend may involve fixed
12 terrestrial medium (e.g., cable/fiber), terrestrial microwave, satellite, or some combination of
13 channels, although satellite channels are the most common presently. The link between a
14 headend and an operations center may be bidirectional to support duplex calling between
15 electronic viewers. Operations centers may be linked together to provide support over an even
16 larger geographical area.

17 In direct broadcast satellite (DBS) systems, the headend is absent or bypassed, and
18 the operations center communicates directly with the subscriber via satellite. To the extent that
19 a DBS satellite link is bidirectional with sufficient upstream bandwidth, a DBS system may also
20 be utilized to support calling between electronic viewers. As an alternative to the DBS system,
21 a separate, dedicated or proprietary system of satellites may be utilized with the present
22 invention to provide a satellite backbone for the network 1000. Alternatively, diverse
23 communication channels, such as telephony or the Internet, can be used to provide upstream
24 communications in conjunction with a downstream satellite transmission. For example, a
25 downstream satellite broadcast of audio and video from a teacher or professor along with
26 upstream audio only transmissions from students via a diverse communication channel is well

1 suited to distance learning applications using the conference calling capabilities of the present
2 invention.

3 The extent to which bidirectional communication capability is present in the cable
4 television system determines the support for calling between set top terminals 220. In one
5 embodiment, a central node within the network 1000 performs signal processing and
6 coordination to establish and manage a multiparty video conference call, as described in greater
7 detail below. A video conferencing central node may be combined or collocated with other
8 equipment in the cable television network. For example, a central node may be associated with
9 an operations center to provide national or regional coverage. A smaller scope of coverage
10 may be supported by a central node associated with a headend. An even smaller scope of
11 coverage may be supported by a central node associated with a fiber node. Continuing one
12 step further, the mini-network, as described above, results when a central node is associated
13 with a local switch.

14 The cellular telephony system is a bidirectional communication network that can be
15 utilized for calls between set top terminals 220 having cellular transceivers. Analog and digital
16 cellular telephony systems are well known in the art and easily support two-party conference
17 calls without video. Digital cellular systems are preferred for use with the present invention,
18 because they offer greater bandwidth, which is necessary for transmission of video. A central
19 node for video conferencing in a cellular network may be a cellular basestation (i.e., at the
20 center of a cell) or mobile switching station, which links many basestations together.

21 A wireless PCS (personal communication system) is another bidirectional
22 communication network that is well known in the art and can be utilized for calls between set
23 top terminals 220 having PCS transceivers. The PCS may be, for example, a PCN.

24 The PSTN (public switched telephone network) can be utilized with the present
25 invention to communicate video conferencing calls among set top terminals 220 having a PSTN
26 interface. The PSTN reaches worldwide and encompasses landlines (both metallic and fiber
27 optic), terrestrial microwave links, and satellite links, as well as a large number of switching

centers and exchanges. The PSTN is well known in the art, and in particular, multiparty conference calling in the PSTN is well known. Furthermore, schemes for video transmission via the PSTN are known in the art. For example, U.S. Pat. No. 5,563,882 (the '882 patent), which is hereby incorporated by reference, discloses a video conferencing system that utilizes ISDN (integrated services digital network) and the H.320 video telephone protocol. The '882 patent discloses a “multipoint control unit (MCU),” which is an example of a video conferencing central node, as used herein.

Hybrids of cable television networks, cellular telephony networks, PCNs, the PSTN, and other networks, such as the Internet, are possible. By way of example, some cable television networks presently provide interconnection to the PSTN and the Internet, so that a television cable can be the single communications conduit for a home or office. Further integration and interconnections to PCNs and/or cellular networks is technically straightforward and likely in the future.

iii. Video Calling Processes and Methods

The processes and methods involved in video calling include call establishment, signal processing and possibly central combining and auxiliary functions such as call storage and retrieval. These processes and methods are described in detail immediately below.

A video conferencing call can be established in a variety of manners. One or more channels for combined audio, video, and possibly other data can be set up at the initialization of the call. Alternatively, video and possibly other data communication can be added to an existing call that initially carries less media or fewer media channels, such as an audio-only call, for example.

In any case, channels for the various media are typically requested by one of the call participants. Requests are communicated to a video conferencing central node via a signaling network that may be inband or out-of-band with respect to the media content of the call. In a circuit switched or connection oriented network, a request is processed by one or more video conferencing central node(s) so as to route the requested media channels, reserve adequate

1 switch ports and/or configure various switches between the call participants as necessary to
2 support the requested media. For example, a request for video communication midstream in
3 an audio-only call that is already established would prompt the video conferencing central node
4 to configure its video switch to establish one or more connections of sufficient bandwidth to
5 accommodate duplex video transmissions and possibly perform other processing to mark, join,
6 or synchronize the video transmissions to the pre-existing audio communications. Further
7 examples of requests schemes in a video conferencing system are disclosed in the '882 patent
8 and U.S. Patent No. 5,896,128 (the '128 patent), which is hereby incorporated by reference.
9 In a packet switched or connectionless network, requests as just described may not be
10 necessary. In an asynchronous transfer mode (ATM) network, which has some qualities of
11 both circuit switching and packet switching, use of requests would be appropriately modified
12 in accordance with well known understanding in the art.

13 It is also possible to add a party to an ongoing video conferencing call. For example,
14 a point-to-point two-party call can be converted to a bridged three-party call. A technique for
15 doing so without disruption to the call is disclosed in the '882 patent.

16 A particular participant may select which, if any, other participants of a conference call
17 will be able to receive all or some of its signals. This selection may be made during initial call
18 establishment or "on the fly." For example, if a party A to a three-way conference call among
19 parties A-C wishes to disclose to party B something secretly from party C, party A may
20 temporarily turn off the ability of party C to hear or view the signals of party A.

21 A set top terminal 220 performs signal processing associated with the transmission and
22 reception of call content. In regards to transmission, the audio signal sensed by the
23 speaker/microphone 2002 is converted to digital form and compressed. For voice or speech
24 audio, the following families of algorithms are particularly suitable: pulse code modulation
25 (PCM), delta modulation (DM) and linear predictive coding (LPC). Each of the above families
26 of algorithms includes variations, such as differential and adaptive variations. Similarly, the
27 video signal sensed by the camera 2000 is converted to digital form and compressed. The

1 fundamental techniques for image compression include vector quantization, discrete cosine
2 transforms, and run-length encoding. Combinations of these techniques are also possible. For
3 video sequences of images, interframe encoding based on motion prediction can be applied to
4 provide further compression gains. These techniques as well as others are utilized in standard
5 video compression algorithms, including low-rate MPEG and ITU standard H.261 and H.263
6 for video conferencing, which are well known in the art. Any compression algorithm that
7 produces acceptably low bit rates for video and/or audio transmission through the network and
8 can be implemented in real time with acceptably small delay is suitable for use with the present
9 invention. Encoding of video and audio may be distinct or interrelated. By way of example,
10 MPEG is a combined standard for both video and audio. These and other features are
11 disclosed in additional detail in the '128 patent.

12 In regards to reception, a set top terminal 220 executes a decompression algorithm
13 corresponding to the compression algorithm. In addition, the set top terminal 220 may perform
14 additional processing of the received signals. For example, the set top terminal 220 can
15 deselect some or all other conference call participants for output on that particular set top
16 terminal 220, scale video images, overlap video images, and otherwise customize the display
17 and output characteristics. Furthermore, the set top terminal 220 may be programmed to
18 automatically select the dominant speaker on the basis of the audio components of the
19 conference call and enlarge the size and/or display resolution of the corresponding video output.
20 These and other reception signal processing features are disclosed in the '128 patent cited
21 above as well as U.S. Patent No. 5,801,756, which is hereby incorporated by reference.

22 Optionally, the video conferencing system can support more sophisticated remote
23 participant controls of video and camera functions. For example, the camera 2000 may be
24 electronically controllable (e.g., electronically steerable, focusing, zoom, pan, etc.) locally or
25 remotely, and one or more other participating viewers 266 can command these electronically
26 controllable aspects of the camera 2000 to customize and dynamically alter the characteristics
27 of the video image sensed by the camera 2000. Alternatively, the same "camera" video effects

1 may be achieved using signal processing techniques. Camera commands and related video
2 manipulation commands can be communicated from the remote (controlling) viewer to the
3 subject (controlled) viewer by a low rate signaling channel.

4 Other conferencing display controls are possible, including, for example: (1) round
5 robin display in a predetermined sequence; (2) visual token passing, wherein everybody can
6 see the participant who holds the token; (3) dominant voice activation, wherein whoever has
7 the loudest audio signal is displayed; and (4) "Hollywood Squares" style display of all
8 participants jointly in an arrangement such as a checkerboard.

9 Additional output manipulations are possible for non-video media. Examples of non-
10 video media (besides audio) include electronic books, data files, documents, spreadsheets,
11 graphics, programs, text streams, web pages, and interactive whiteboards. Each of the above
12 can be contained within a window on the display 602 and sized, positioned and layered to suit
13 the user's preferences. Alternately, each of the above can be provided as a picture-in-picture,
14 as described in the above-cited Application Serial No. 09/335,268. According to one process
15 of the present invention, a new object for display, when it is received at a set top terminal 220,
16 is initially displayed as a small icon. When the user provides input to open the icon (e.g., by
17 clicking it), the icon transforms into a window of default size and position. The user can then
18 adjust the display characteristics of the window. In the case of an interactive whiteboard, each
19 participant in the conference call may view and potentially edit the contents of the whiteboard,
20 which is preferably a window on which simple drawings, graphics, and text may be entered.
21 Each call participant sees the same version of the whiteboard, which is globally updated
22 periodically or as necessary.

23 A receiving set top terminal 220 with sufficient memory can record a call in its entirety
24 or selected components of a call, including one's own audio, video, or other components. The
25 ability to store and later retrieve calls or call components is useful for record keeping,
26 recollection or message delivery. The record function can be programmed to operate without
27 a human user present at the receiving set top terminal 220. In this case, the record function

1 provides the set top terminal 220 with the capability of an answering machine or voice mail
2 system with video and/or other media embodiments. By way of illustration of this capability,
3 an unattended set top terminal 220 may receive a video call from a calling party. The
4 unattended set top terminal 220 answers the call automatically and transmits an audio/video
5 greeting to the calling party. In response to the greeting, the calling party transmits an
6 audio/video message to the unattended set top terminal 220, which records the message.

7 A receiving set top terminal 220 can also convert an audio message to text in
8 accordance with algorithms (e.g., voice recognition) that are well known in the art. The
9 resulting text file can be displayed on the display 602 of the set top terminal 220 or stored in
10 memory, within the set top terminal 220. This feature is useful to produce a transcript of a call
11 or to "listen" to a call or message silently. The same speech to text conversion capability can
12 be utilized with outgoing calls or messages as well. By way of example, a user may choose to
13 transmit her audio signal as a text stream in place of or in addition to her audio signal. The set
14 top terminal 220 can also be programmed to convert text to speech in accordance with well
15 known algorithms. Such a feature is useful for users who have difficulty seeing or reading.
16 Additional details of conversion between speech and text are provided in the above-cited
17 application serial no. 09/344,449.

18 Some or all of the set top terminal 220 functionality, as described in the preceding
19 section can be performed by a video conferencing central node instead (or additionally). For
20 example, the record and storage function can be easily, and in cases advantageously, located
21 in a central storage node rather than distributed among set top terminals 220. As further
22 examples, a central node can perform speech-text conversion and can store and manage an
23 interactive whiteboard. Central unit recording, storage and management are desirable when
24 the content of the video conference call concerns a lecture or presentation.

25 In a preferred embodiment, a video conferencing central node performs central
26 combining for a conference call. Central combining simplifies the communication among the
27 viewers 266 participating in a conference call by establishing full duplex connections having

1 fixed or bounded bandwidth, one between each participating set top terminal 220 and the
2 central node. The central node manages all aspects of the call and is ultimately responsible for
3 the selection of information received by each participating viewer on its single channel. The
4 central node receives all uplink transmissions of video, audio and possibly other media. The
5 central node then makes various combinations of the uplink data, one combination being
6 transmitted to each participating set top terminal 220. Each participating set top terminal 220
7 can customize its downlink combination and output display, as described above by
8 communicating configurations commands to the central node, which effects the requested
9 configuration. Further details of central combining for video conferencing is disclosed in the
10 '128 patent already cited and U.S. Patent No. 5,657,096, which is hereby incorporated by
11 reference.

12 Figure 34 illustrates central combining for a conference call among the three set top
13 terminals 220a-220c. A node 1025 is the central node for this call. Nodes 1030 and 1035
14 are utilized for connection of the set top terminal 220a. In this example, the network 1000
15 initially determines that the node 1025 would act as the central node. Upon establishment of
16 the conference call, signaling within the network 1000 occurs to set up the node 1025 as the
17 central node and to configure switches at the nodes 1030 and 1035 so as to make the
18 connections as shown, in the case of circuit switching. In the case of packet switching, the
19 illustrated routes may be ones or the most likely ones of many possible routes for given
20 packets. Signals such as video, audio, and/or other media generated or originating at the set
21 top terminal 220a are transmitted to the central node 1025. Likewise, each of the set top
22 terminal 220b and 220c transmit signals to the central node 1025. In one embodiment, each
23 of the set top terminal 220a-220c also transmits via signaling connections configuration
24 information pertaining to its display setup and other functions. Based on this configuration
25 information, the central node 1025 performs combining of data from some or all of the three
26 signals to create three customized return signals -- one for each of the set top terminal 220a-
27 220c -- and transmits the return signals along the paths shown. One skilled in the art will

1 appreciate that transmissions to/from a given set top terminal need not share the same path
2 physically or logically.

3 In one embodiment, the central node 1025 performs audio combining. Typically, the
4 audio uplink components from every other participating set top terminal 220 are summed to
5 create a sum or combined audio signal, which is then transmitted to a participating set top
6 terminal 220 as part or all of its return transmission. Audio summation combining has the effect
7 of allowing every call participant to hear all other participants, as occurs in a face to face
8 conference. Optionally, a set top terminal's own uplink audio signal can be added to the sum
9 downlink audio it receives, thus providing a sidetone, which is useful if the viewer wears
10 headphones. The summation can be a weighted sum and the weighting can be altered
11 dynamically. For example, relative audio weights, and thus amplification, can be in proportion
12 to the size of that speaker's corresponding video image on a particular viewer screen. As
13 another example, the relative audio weight of the dominant speaker at any time may be
14 increased. The time relationship between the component audio signals and their corresponding
15 video signals is maintained and synchronized as necessary. Those skilled in the art will
16 appreciate these and many other variations and features from well known techniques of audio
17 conferencing.

18 In an embodiment of the present invention, the central node 1025 performs video
19 processing to combine various video components of a video conferencing call. In the simplest
20 case, the central node 1025 switches video signals from one or more uplinks to a given
21 downlink without processing the content of the video signals. In this case, each set top terminal
22 220 performs any video content processing. In a more active role, the central node 1025
23 performs substantive processing of the video signals to create a composite video signal for each
24 participating set top terminal 220. In this more active role, the central node 1025 can select
25 from the available uplink video images (still or moving) as well as other media, position and
26 scale the images. Downward scaling (shrinking) of images may result in a reduction of
27 resolution compared to the corresponding video signal. Upward scaling (enlargement or

1 magnification) of images may produce a coarser image whose resolution can be enhanced using
2 well known techniques, such as, for example, image interpolation and edge enhancement. The
3 composite image for each participating set top terminal 220 is then encoded for transmission.
4 Standard digital encoding formats for moving video are preferred, such as, for example, an
5 MPEG, H.261 or H.263 format.

6 Figure 35 is a block diagram of the video conferencing central node 1025. The central
7 node 1025 contains circuitry to perform the functions just described, including a video
8 combiner 1410, audio summation combiner 1415, and a switch 1420. The central node 1025
9 also contains a synchronizer 1425 to adjust relative timing between audio and video signals as
10 necessary and a memory 1430 in which signals can be recorded for future retrieval and
11 playback. A signaling module 1435 transmits and receives signaling information to/from
12 viewers and other nodes. Finally, a controller 1440 controls the operation of the other
13 circuitry. Those skilled in the art will recognize that other arrangements than the one illustrated
14 in Figure 11 are possible and that another node or central node may contain less than all of the
15 illustrated circuitry.

16 iv. Caller ID for Video Calls

17 For a set top terminal receiving an incoming video call over the PSTN, cellular
18 telephony or PCS networks, the caller identification techniques described in section C(4)(g),
19 above, are applicable. For a set top terminal receiving an incoming video call over a cable
20 television network, the caller identification data is preferably embedded in a vertical blanking
21 interval (VBI) or program control information signal (PCIS), as described in earlier sections.
22 For a set top terminal receiving an incoming video call over a cable television network, the
23 caller identification data is preferably contained in a TCP/IP (transmission control protocol/
24 Internet protocol) packet preceding the call packets. Preferably, the caller identification data
25 is transmitted over the same network as the call itself, but this need not be the case.

26 v. Program Pausing for Video Calls

1 The automatic program pause feature described in section C(4)(I), above, can be used
2 without modification when the communications event is a video call event, which is a
3 communication event involving video in any way.

4 vi. Video Call - Video Program Picture-in-Picture

5 Picture-in-picture viewing of a video program and a video call together is also possible.
6 The viewer/call participant can select different orientations of the video components (e.g., call
7 video in program video, *vice versa*, split screen). The viewer/call participant can also select
8 whether to hear the call audio, the program audio or a summation of both. As an example, two
9 sports enthusiasts may each watch the same sports event program while engaging in an
10 interactive picture-in-picture video call to discuss the action. In addition, other content may be
11 exchanged as part of the call, including files, a whiteboard and/or “telestrator” or “John
12 Madden Pen” markings on the video program, making the program-call combination a shared
13 multimedia experience.

14 The terms and descriptions used herein are set forth by way of illustration only and are
15 not meant as limitations. Those skilled in the art will recognize that numerous variations are
16 possible within the spirit and scope of the invention as defined in the following claims.

17 What is claimed is:

CLAIMS

1. A method for automatically pausing a video program in response to an occurrence of a video call event, comprising:

receiving a video program and outputting the video program for presentation on a display device;

detecting occurrence of a video call event during the video program;

pausing the video program in response to the detection of the occurrence of the video call event; and

outputting a signal for displaying an indication of the occurrence of the video call event.

2. The method of claim 1 wherein the detecting step includes detecting an incoming video telephone call.

3. The method of claim 2 wherein the outputting step includes outputting a signal for displaying a telephone number associated with the incoming video telephone call.

4. The method of claim 3 wherein the outputting includes outputting a signal for displaying a text message associated with the telephone number.

5. The method of claim 3 wherein the outputting step includes outputting a signal for displaying a graphic associated with the telephone number.

6. The method of claim 1 wherein the detecting step includes detecting an incoming e-mail message containing video content.

1 7. The method of claim 6 wherein the outputting step includes outputting the e-mail
2 message for presentation on the display device.

3 8. The method of claim 1 wherein the detecting step includes detecting an incoming
4 message with video content.

5 9. The method of claim 8 wherein the outputting step includes outputting the message
6 for presentation on the display device.

7 10. The method of claim 1 wherein the detecting step includes detecting an incoming
8 web page containing video content.

9 11. The method of claim 10 wherein the outputting step includes outputting the web
10 page for presentation on the display device.

11 12. The method of claim 1, further comprising:
12 receiving a play signal to restart the video program; and
13 transmitting, in response to the play signal, the video program for presentation on
14 the display device starting at an approximate location where the video program was paused.

15 13. The method of claim 12, further comprising:
16 receiving a fast forward signal to increase a rate of transmission of the video
17 program; and
18 transmitting, in response to the fast forward signal, the video program for
19 presentation of an increased rate of display on the display device.

20 14. The method of claim 12, further comprising:

1 receiving a rewind signal to reverse a direction of presentation of the video
2 program; and
3 transmitting, in response to the rewind signal, the video program for presentation in
4 a reversed direction of progression on the display device.

5 15. The method of claim 12, further comprising:
6 receiving a slow motion signal to decrease a rate of transmission of the video
7 program; and
8 transmitting, in response to the slow motion signal, the video program for
9 presentation at a decreased rate of display on the display device.

10 16. The method of claim 1, further comprising:
11 receiving a frame forward signal to display a next frame of the video program; and
12 transmitting, in response to the frame forward signal, a next frame of the video
13 program for presentation on the display device.

14 17. The method of claim 1, further comprising:
15 receiving a frame back signal to display a previous frame of the video program; and
16 transmitting, in response to the frame back signal, a previous frame of the video
17 program for presentation on the display device.

18 18. The method of claim 12, further comprising:
19 receiving a jump signal to display the video program from a new point of
20 transmission; and
21 transmitting, in response to the jump signal, the video program for presentation of
22 the video program from the new point on the display device.

1 19. The method of claim 1 wherein the receiving step includes receiving information to
2 associate with a particular phone number.

3 20. The method of claim 19 wherein the received information is one or more selected
4 from the group consisting of textual information and graphical information.

5 21. The method of claim 19 wherein:
6 the detecting step includes detecting occurrence of an incoming video telephone call
7 associated with the particular phone number; and
8 the outputting step includes outputting a signal for displaying the information
9 associated with the particular phone number.

10 22. The method of claim 1 further comprising:
11 answering the video call.

12 23. The method of claim 22 wherein the answering step comprises:
13 producing an indication of the video call; and
14 accepting an instruction from a viewer to answer the video call.

15 24. The method of claim 23 wherein the instruction comprises depression of a button on
16 a remote control

17 25. The method of claim 1 wherein the video call is a conference call involving more
18 than two parties.

19 26. The method of claim 25 further comprising:

1 adding a party to the conference video call.

2 27. The method of claim 25 further comprising:
3 dropping a party from the conference video call.

4 28. The method of claim 25 further comprising:
5 selectively blocking communication to a party for a period of time.

6 29. An apparatus for automatically pausing a video program in response to an
7 occurrence of a video call event, comprising:
8 a receive module for receiving a video program and outputting the video program
9 for presentation on a display device;
10 a detection module for detecting occurrence of a video call event during the video
11 program;
12 a pause module for pausing the video program in response to the detection of the
13 occurrence of the video call event; and
14 an output module for outputting a signal for displaying an indication of the
15 occurrence of the video call event.

16 30. The apparatus of claim 29 wherein the detection module includes a module for
17 detecting an incoming video telephone call.

18 31. The apparatus of claim 30 wherein the indication of the occurrence of the video call
19 event comprises a telephone number associated with the incoming video telephone call.

20 32. The apparatus of claim 29 wherein the detection module includes an e-mail detector
21 module that detects an incoming e-mail message containing video content.

1 33. The apparatus of claim 29 wherein the output module includes an e-mail
2 presentation module that outputs the e-mail message for presentation on the display device.

3 34. The apparatus of claim 29 wherein the detection module includes a web page
4 detector module that detects an incoming web page.

5 35. The apparatus of claim 30 wherein the output module includes a web page output
6 module that outputs the web page for presentation on the display device.

7 36. The apparatus of claim 29, further comprising:
8 a module for receiving a play signal to restart the video program; and
9 a module for transmitting, in response to the play signal, the video program for
10 presentation on the display device starting at an approximate location where the video
11 program was paused.

12 37. The apparatus of claim 36, further comprising:
13 a module for receiving a fast forward signal to increase a rate of presentation of the
14 video program; and
15 a module for transmitting, in response to the fast forward signal, the video program
16 for presentation of the video program at an increased rate of display on the display device.

17 38. The apparatus of claim 36, further comprising:
18 a module for receiving a rewind signal to reverse a direction of presentation of the
19 video program; and
20 a module for transmitting, in response to the rewind signal, the video program for
21 presentation in reversed direction of presentation on the display device.

1 39. The apparatus of claim 36, further comprising:
2 a module for receiving a slow motion signal to decrease a rate of presentation of the
3 video program; and
4 a module for transmitting, in response to the slow motion signal, the video program
5 at for presentation at a decreased rate of display on the display device.

6 40. The apparatus of claim 29, further comprising:
7 a module for receiving a frame forward signal to display a next frame of the video
8 program; and
9 a module for transmitting, in response to the frame forward signal, a next frame of
10 the video program for presentation on the display device.

11 41. The apparatus of claim 29, further comprising:
12 a module for receiving a frame back signal to display a previous frame of the video
13 program; and
14 a module for transmitting, in response to the frame back signal, a previous frame of
15 the video program for presentation on the display device.

16 42. The apparatus of claim 29, further comprising:
17 a camera.

18 43. The apparatus of claim 42, further comprising:
19 a camera activation button.

20 44. The apparatus of claim 29, further comprising:
21 a call answer button.

1 45. The apparatus of claim 29, further comprising:
2 a call hangup button.

3 46. A method for automatically pausing a video program in response to an occurrence
4 of an event, comprising:

5 receiving a video program and outputting the video program for presentation on a
6 display device;

7 detecting occurrence of a video call event during the video program;

8 displaying an indication of the video call event;

9 detecting a triggering event related to the video call event; and

10 pausing the video program in response to the detection of the triggering event.

11 47. The method of claim 46 wherein the displaying step includes displaying one or more
12 of the group consisting of an overlay menu, a hidden men and an icon.

13 48. The method of claim 46 wherein the displaying step includes displaying one or more
14 of the group consisting of an overlay menu and a hidden menu.

15 49. The method of claim 46 wherein the video call event is reception of one or more of
16 the group consisting of a video phone call, an e-mail message with video content, a
17 message having video content, or web page containing video content.

18 50. The method of claim 46 wherein the triggering event comprises one or more of the
19 group consisting of a phone off-hook condition, selection of an e-mail indication, selection
20 of a message indication, selection of a web page indication, and initiation of a video call.

1 51. The method of claim 46 wherein the video call event is a conference call involving
2 more than two parties.

3 52. A method for caller identification using a set top terminal, the method comprising:
4 receiving a telephone signal with a set top terminal, the telephone signal having video
5 content;
6 processing the received telephone signal; and
7 displaying the processed telephone signal.

8 53. The method of claim 52, wherein the step of displaying comprises overlaying the
9 processed telephone signal over video.

10 54. The method of claim 52, wherein the step of processing further comprises:
11 generating at least one menu.

12 55. The method of claim 52, wherein the step of processing further comprises
13 identifying a telephone number from which the telephone signal was initiated.

14 56. The method of claim 49, wherein the step of identifying a telephone number further
15 comprises storing a list of telephone numbers and a list of names in memory, wherein each
16 stored telephone number corresponds to a stored name.

17 57. The method of claim 56, wherein the step identifying a telephone number further
18 comprises matching the identified telephone number with one of said stored telephone
19 number.

1 58. The method of claim 57, wherein the step of identifying a telephone number further
2 comprises identifying the name stored in memory which corresponds to the matched
3 telephone number.

4 59. The method of claim 58 further comprising:
5 monitoring the received telephone signal.

6 60. The method of claim 59 wherein the received telephone signal is an incoming
7 telephone call, and the step of monitoring comprises sensing an incoming telephone call.

8 61. The method of claim 59, wherein the step of sensing an incoming telephone call
9 comprises sensing that a telephone is ringing.

10 62. The method of claim 52, wherein the telephone signal includes a signal on a ring line
11 and the step of receiving comprises sensing a signal on the ring line.

12 63. The method of claim 52, wherein the step of receiving a telephone signal comprises
13 receiving a telephone signal from a cellular telephone network.

14 64. The method of claim 52, wherein the step of receiving a telephone signal comprises
15 receiving a telephone signal from a personal communications network.

16 65. The method of claim 52, further comprising the step of answering the displayed
17 telephone signal.

18 66. The method of claim 52, wherein the step of receiving a telephone signal comprises
19 receiving a telephone signal from a cable system.

1 67. The method of claim 52, wherein the step of receiving a telephone signal comprises
2 receiving a telephone signal from a satellite system.

3 68. The method of claim 52, further comprising:
4 electronically capturing a video image of a user of the set top terminal; and
5 transmitting the video image to the source of the telephone signal.

6 69. The method of claim 68 wherein a camera electronically captures the video image
7 of a user of the set top terminal, the method further comprising:
8 receiving a signal to activate the camera.

9 70. The method of claim 69 further comprising:
10 receiving instructions from the user of the set top terminal; and
11 pointing the camera in accordance with the instructions.

12 71. The method of claim 52 further comprising:
13 providing a conference call involving the telephone signal.

14 72. A set top terminal for use in displaying a program and telephone call identification,
15 comprising:
16 a receiver, wherein data indicating telephone identification is received;
17 a processor, operably connected to the receiver, wherein the received data
18 indicating telephone call identification is processed; and
19 a generator, operably connected to the processor, wherein the processed data
20 indicating telephone call identification is used to generate a signal for display.

1 73. The set top terminal of claim 72, wherein the receiver comprises a telephone
2 modem.

3 74. The set top terminal of claim 72 further comprising a television set, operably
4 connected to the generator, whereby the signal for display is received by said television set.

5 75. The set top terminal of claim 72, wherein the processor further comprises
6 processing circuitry for identifying a telephone number from which a telephone call was
7 initiated.

8 76. The set top terminal of claim 72, wherein the processor, based on the received
9 data indicating telephone call identification, produces at least one text message and at least
10 one graphics icon.

11 77. The set top terminal of claim 72, further comprising memory connected to the
12 processor for storing a list of telephone numbers and a list of names, wherein each stored
13 telephone number corresponds to a stored name.

14 78. The set top terminal of claim 72, wherein the generator generates a signal for
15 display that comprises the identified name.

16 79. The set top terminal of claim 72 wherein the generator comprises a text generator.

17 80. The set top terminal of claim 72, wherein the generator generates at least one menu
18 to be displayed.

1 81. The set top terminal of claim 80, wherein the at least one menu is generated based
2 on the received data indicating telephone call identification.

3 82. The set top terminal of claim 72, further comprising a telephone message system.

4 83. The set top terminal of claim 72, further comprising an automatic message system
5 wherein an activation signal activates the automatic telephone message system.

6 84. The set top terminal of claim 72, wherein the receiver is adapted to receive a video
7 telephone signal from one or more of the group consisting of a cable system, a cellular
8 telephone network, a personal communications network and a satellite system.

9 85. The set top terminal of claim 72 further comprising:
10 a turbo card for generating at least one menu to be displayed, wherein the at least
11 one menu is generated based on the received data indicating telephone call identification.

12 86. The set top terminal of claim 72, further comprising:
13 a camera.

14 87. The set top terminal of claim 72, further comprising:
15 a camera port.

16 88. The set top terminal of claim 86, further comprising:
17 one or more buttons from the group consisting of a camera activation button, a call
18 answer button and a call hangup button.

19 89. The set top terminal of claim 88, further comprising:

1 a remote control, the one or more buttons located on the remote control.

2 90. A method of displaying a video program and a video call together, the method
3 comprising:

4 displaying a video program on a display; and
5 displaying a video call on the display.

6 91. The method of claim 90 wherein the video program is accompanied by audio and
7 the video call is accompanied by audio, the method further comprising:

8 accepting a user selection for either program audio or call audio;
9 sounding the selected audio; and
10 suppressing the nonselected audio.

11 92. The method of claim 90 wherein the video program is accompanied by an audio
12 signal and the video call is accompanied by an audio signal, the method further comprising:

13 summing the program audio signal and call audio signal to form a summed audio
14 signal; and
15 sounding the summed audio signal.

16 93. The method of claim 90 wherein the video call is displayed as a picture in picture of
17 the video program.

18 94. The method of claim 90 wherein the video program is displayed as a picture in
19 picture of the video call.

1 95 The method of claim 90 wherein the video call is a conference call with multiple
2 video components, and wherein the video program and the multiple video calls are
3 displayed on a split screen.

4 96 The method of claim 90 further comprising:
5 accepting from the user markings for overlay on the program video; and
6 communicating the markings to another party in the video call.

7 97 The method of claim 90 further comprising:
8 providing an on-screen whiteboard; and
9 accepting input onto the whiteboard from a party in the video call

10 98. A hardware upgrade for a terminal, the hardware upgrade comprising:
11 a terminal interface for connection to the terminal;
12 a camera interface, the camera interface for connecting to a video camera; and
13 video call circuitry connected to the terminal interface and the camera interface,
14 whereby video from the camera interface is transmitted via the terminal interface as part of a
15 video call.

16 99. The hardware upgrade of claim 98 further comprising:
17 a camera connected to the camera interface.

18 100. The hardware upgrade of claim 98 further comprising:
19 a microphone interface, the microphone interface for connecting to an audio
20 microphone, whereby audio transferred via the microphone interface is part of the video
21 call.

1 101. The hardware upgrade of claim 100 further comprising:
2 a microphone connected to the microphone interface.

3 102. The hardware upgrade of claim 98 wherein the terminal interface comprises a
4 connector selected from the group consisting of a four-wire connector, a multipin connector
5 and a SCSI connector.

6 103. The hardware upgrade of claim 98 further comprising a microprocessor connected
7 to the camera interface, wherein the microprocessor controls the camera.

8 104. The hardware upgrade of claim 98 wherein the video call circuitry comprises a
9 video combiner, wherein the video combiner combines video signals from two or more
10 sources for display on an attached television, the sources selected from the group consisting
11 of a remote end of the video call, the camera interface and a video program.

12 105. The hardware upgrade of claim 98 further comprising a menu generator, wherein
13 the menu generator generates menus of video call options for display on an attached
14 television.

A set top terminal equipped with a camera and microphone includes the capability to send and receive video calls through a cable television delivery system or other communications networks. In response to detection of the occurrence of a video call event or triggering event, a video program is automatically paused. In response to an incoming video phone call, message, web page, or other video communications information, the system pauses the video program and displays an indication of the occurrence of the communications event. The system also buffers the video program while paused, permitting a user to replay missed portions of it. Alternatively, the system waits for a triggering event, which includes the user's access to the communications event, in order to pause the video program. The set top terminal also includes features for caller identification of video calls and dual display of video programs and video calls, such as picture in picture. A hardware upgrade for adding video call functionality to a set top terminal is also disclosed.

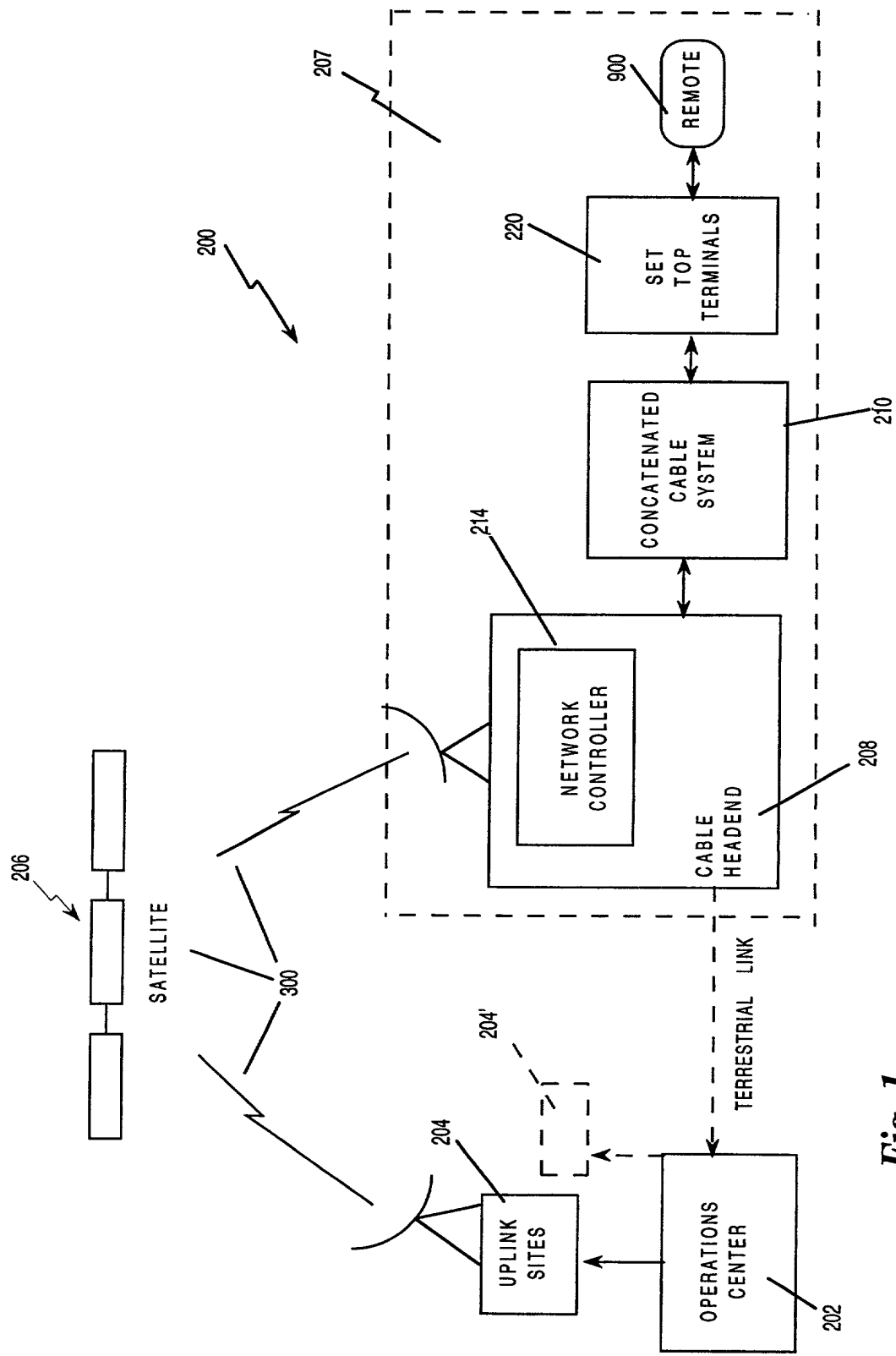


Fig. 1

Fig. 2

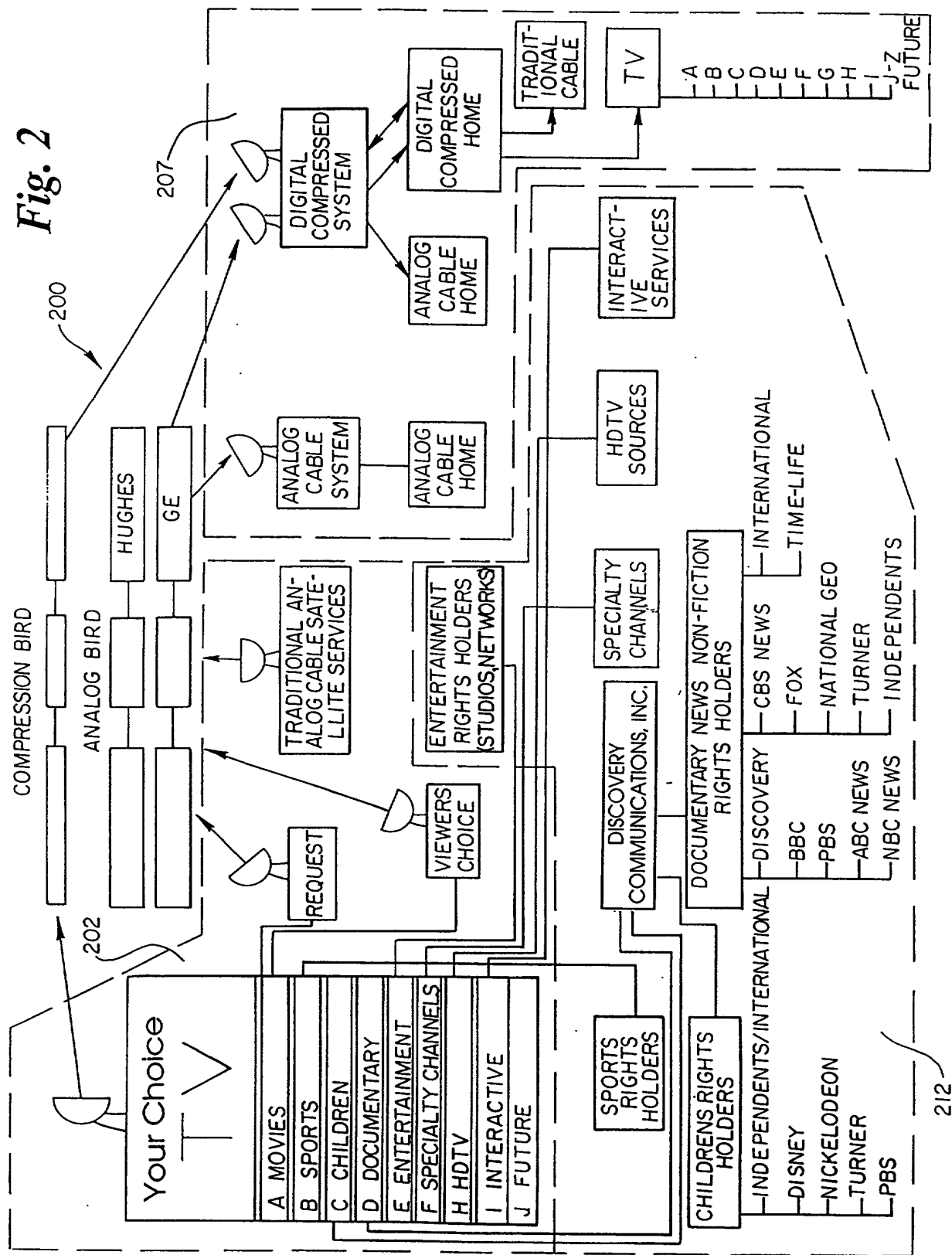
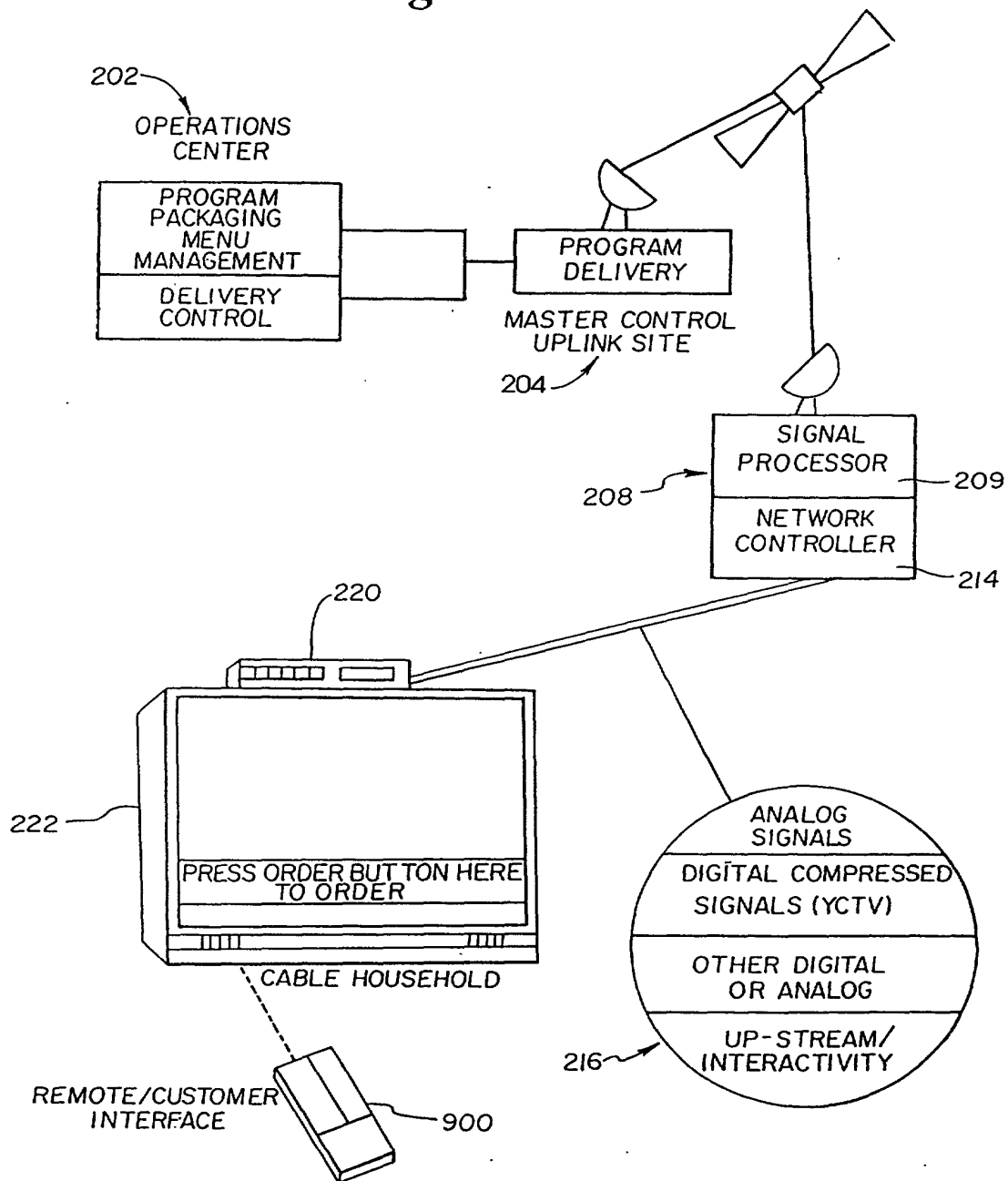
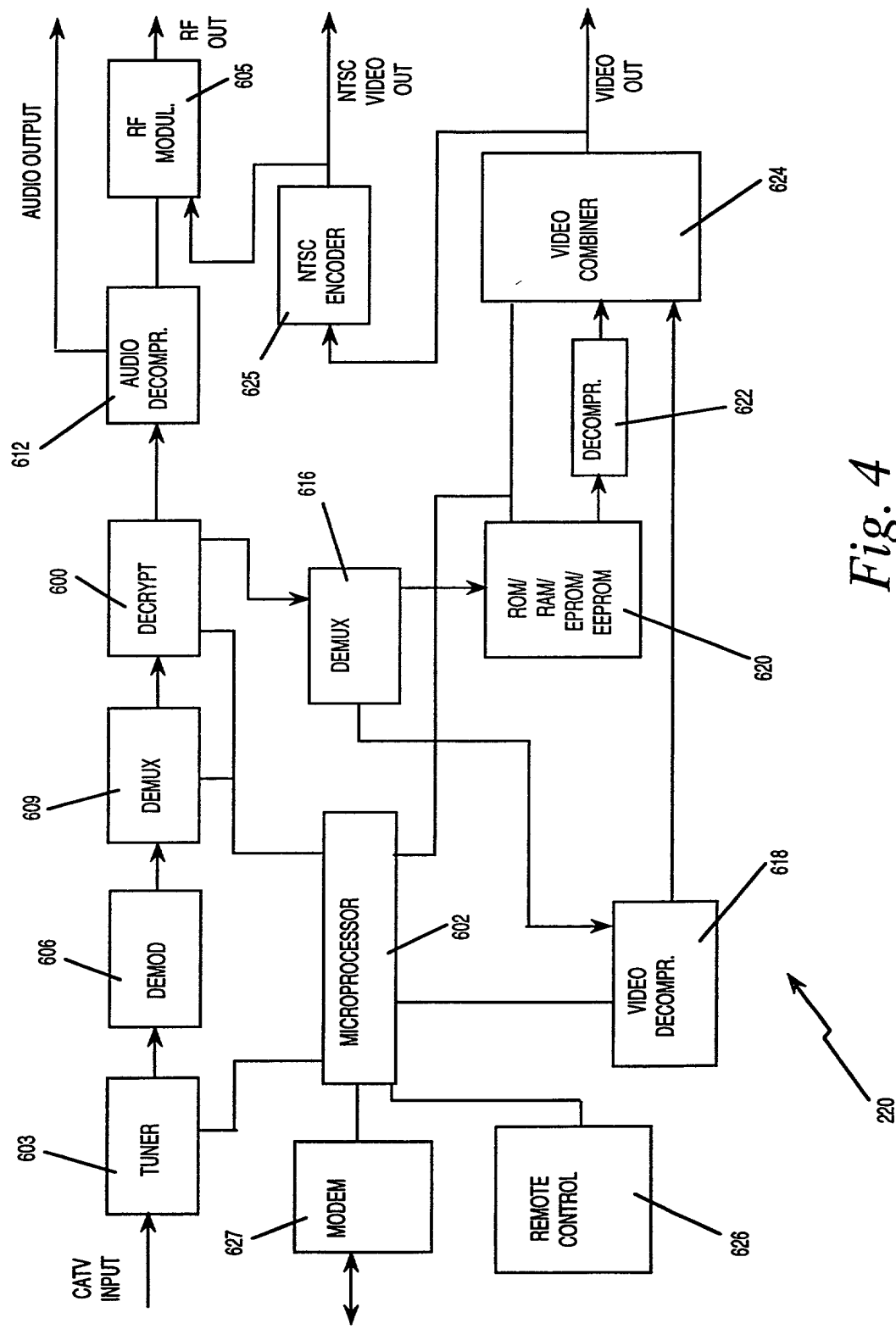


Fig. 3





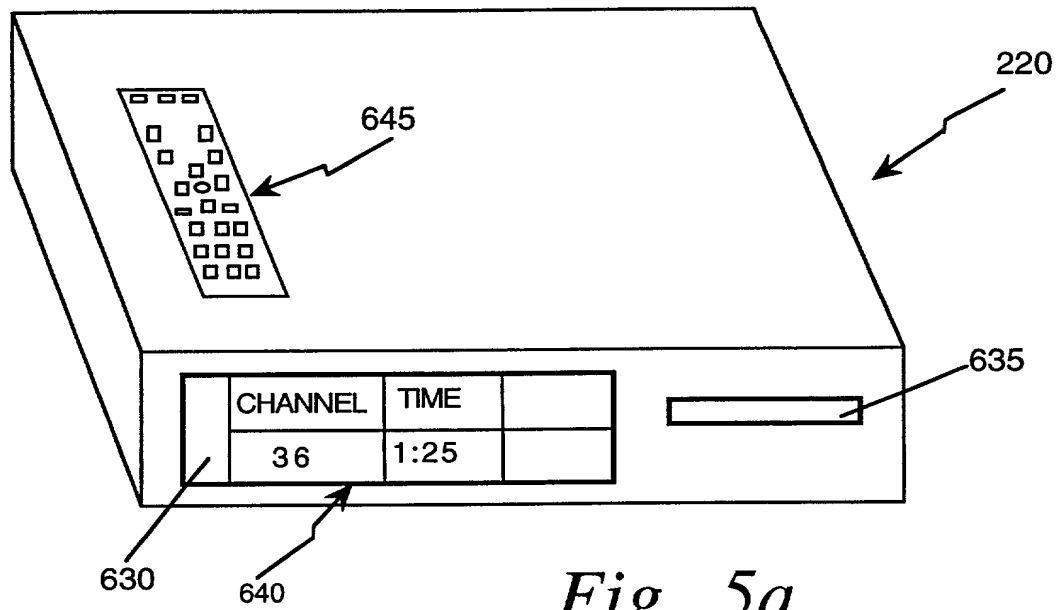


Fig. 5a

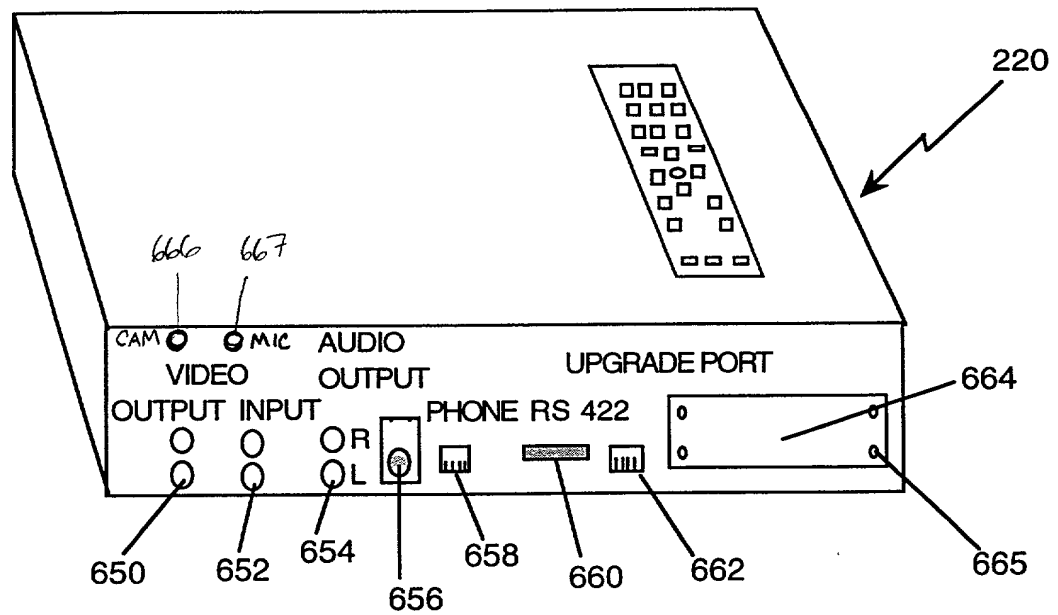


Fig. 5b

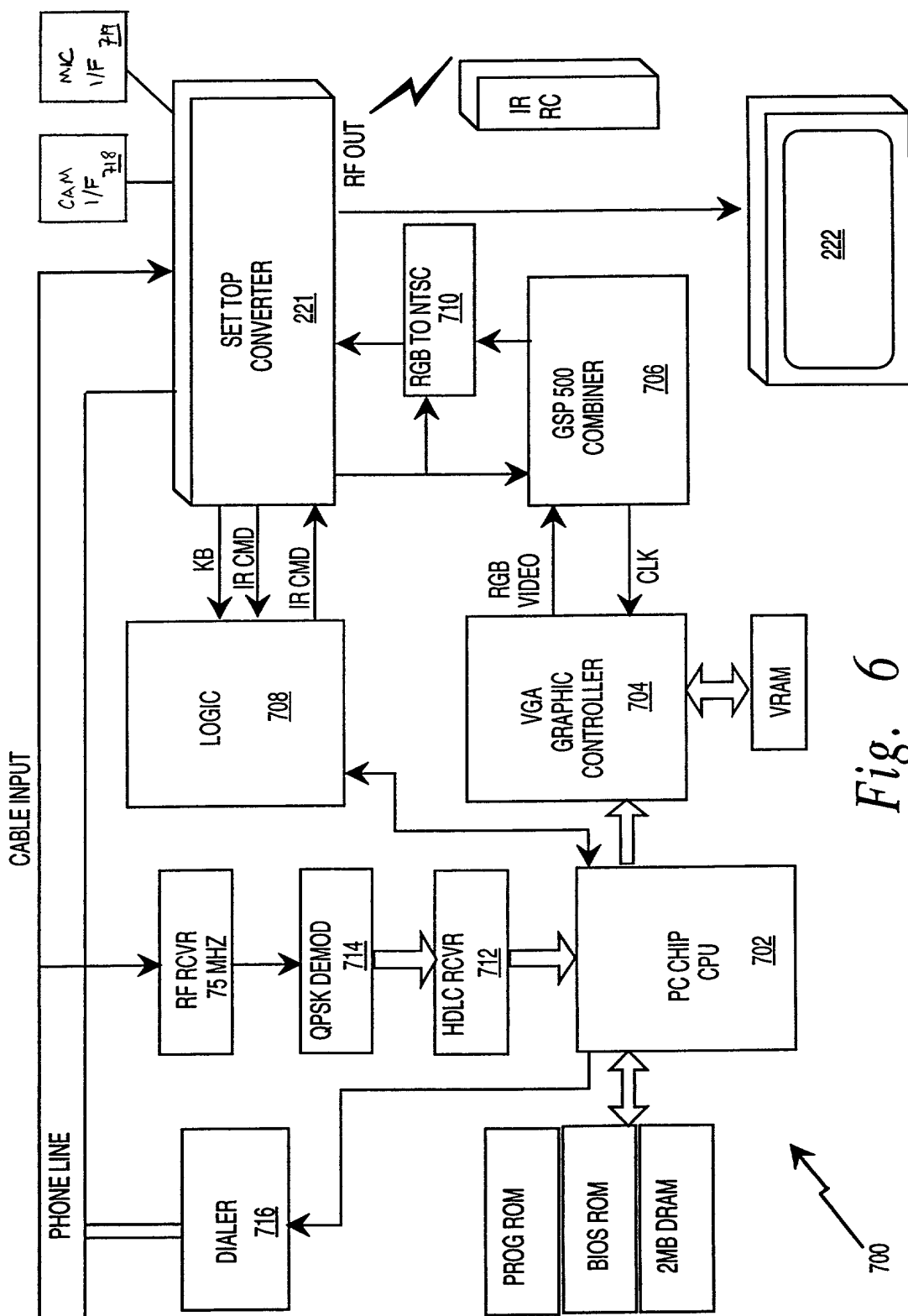


Fig. 6

700

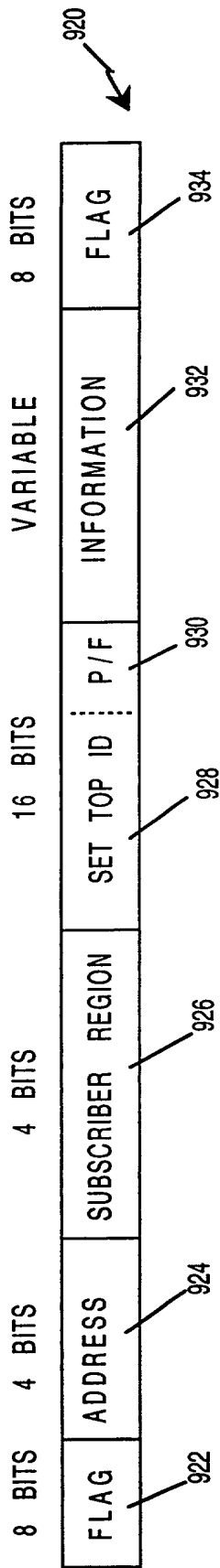


Fig. 7a

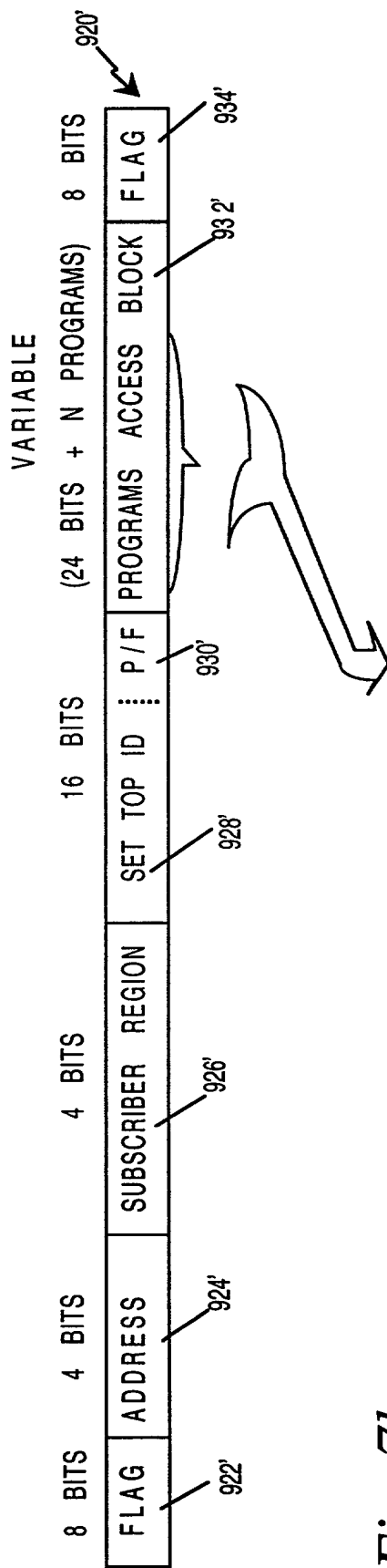
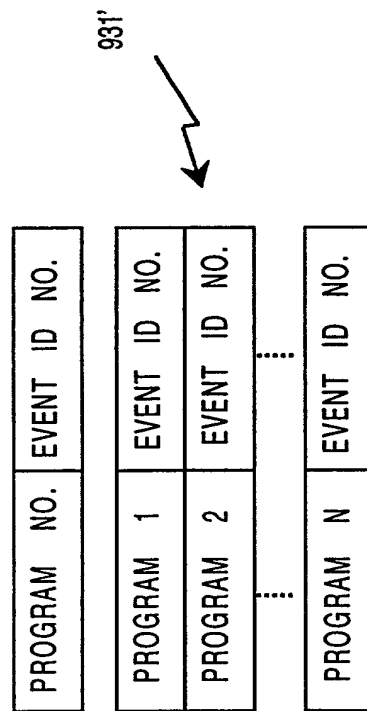


Fig. 7b



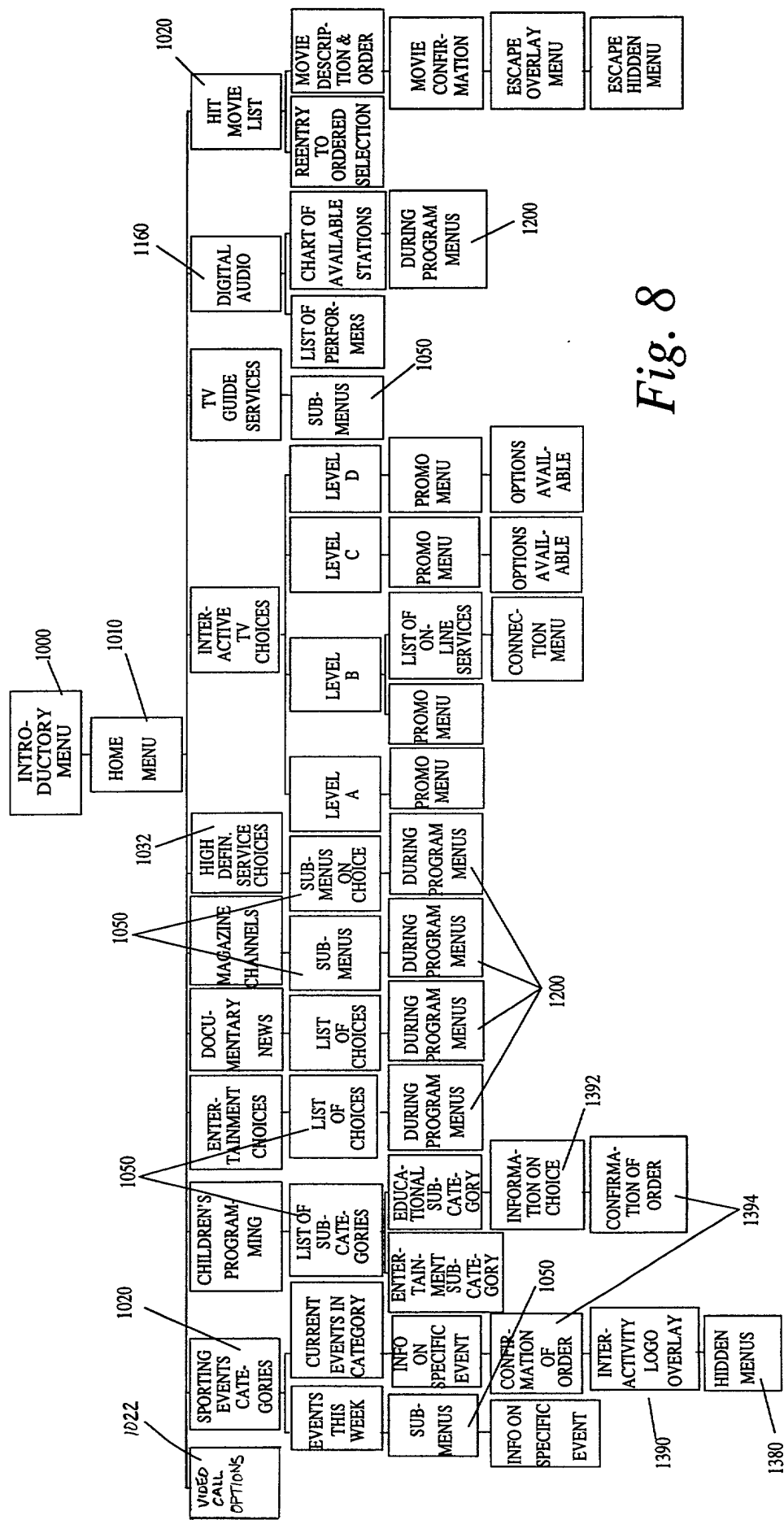


Fig. 8

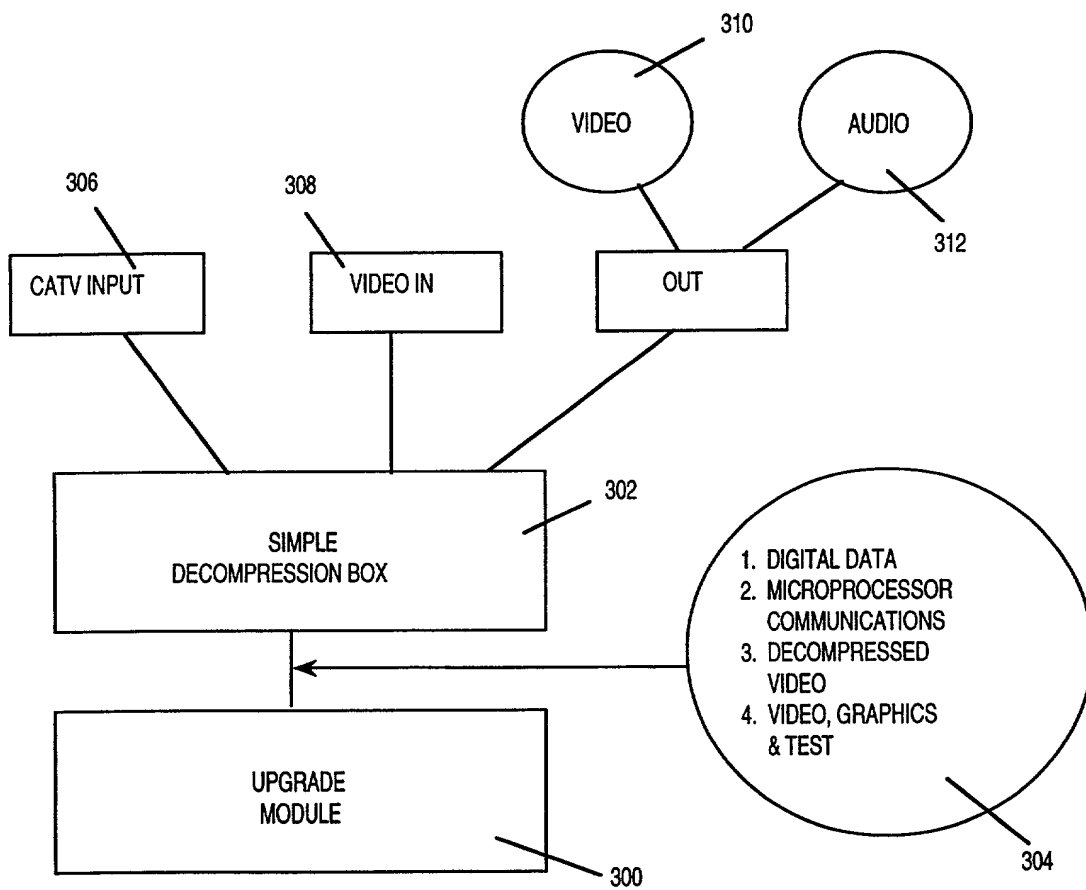


Fig. 9a

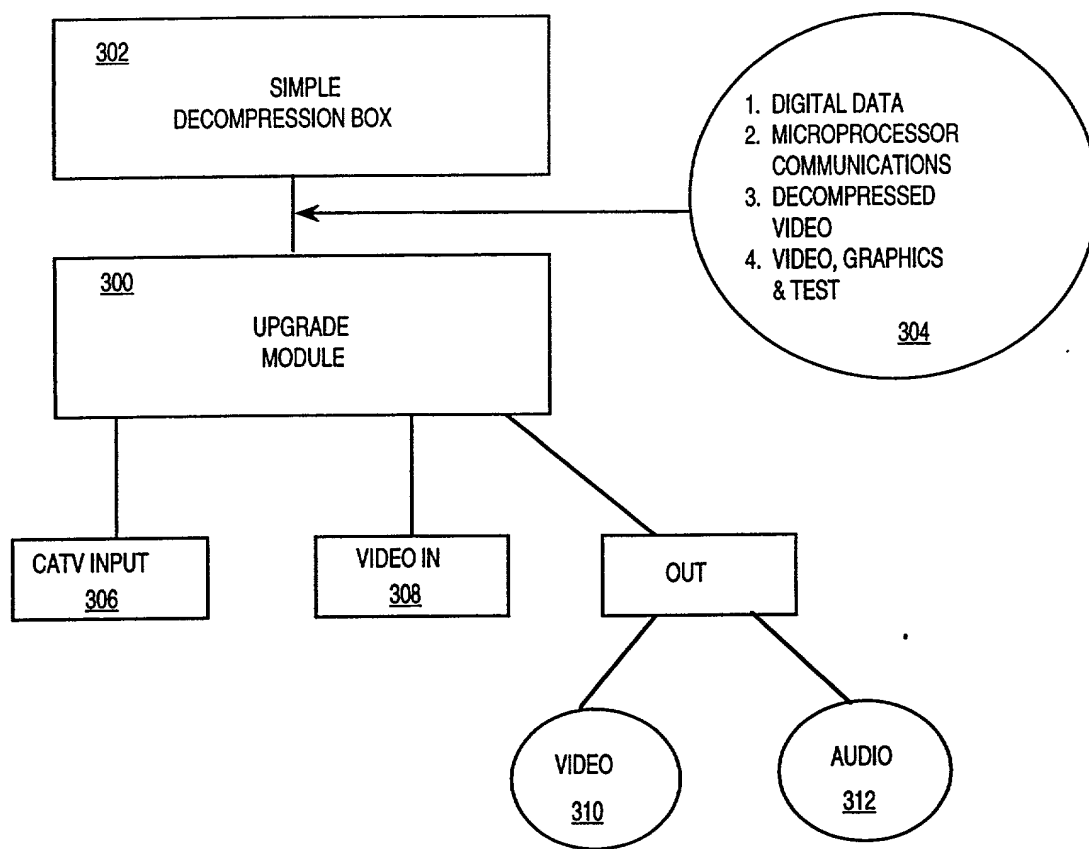


Fig. 9b

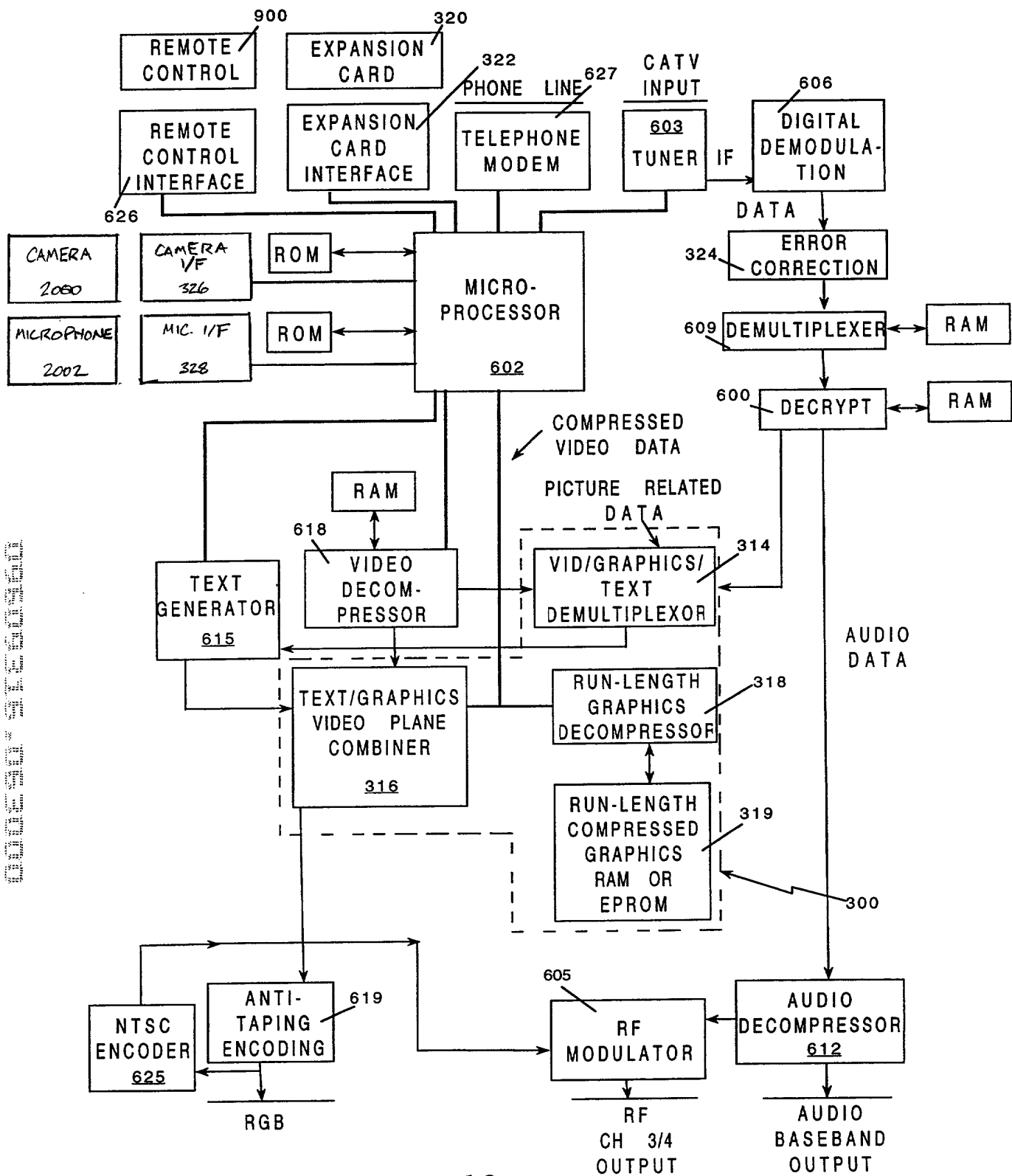
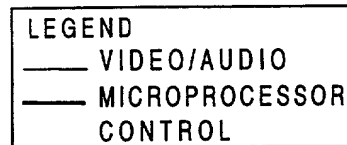
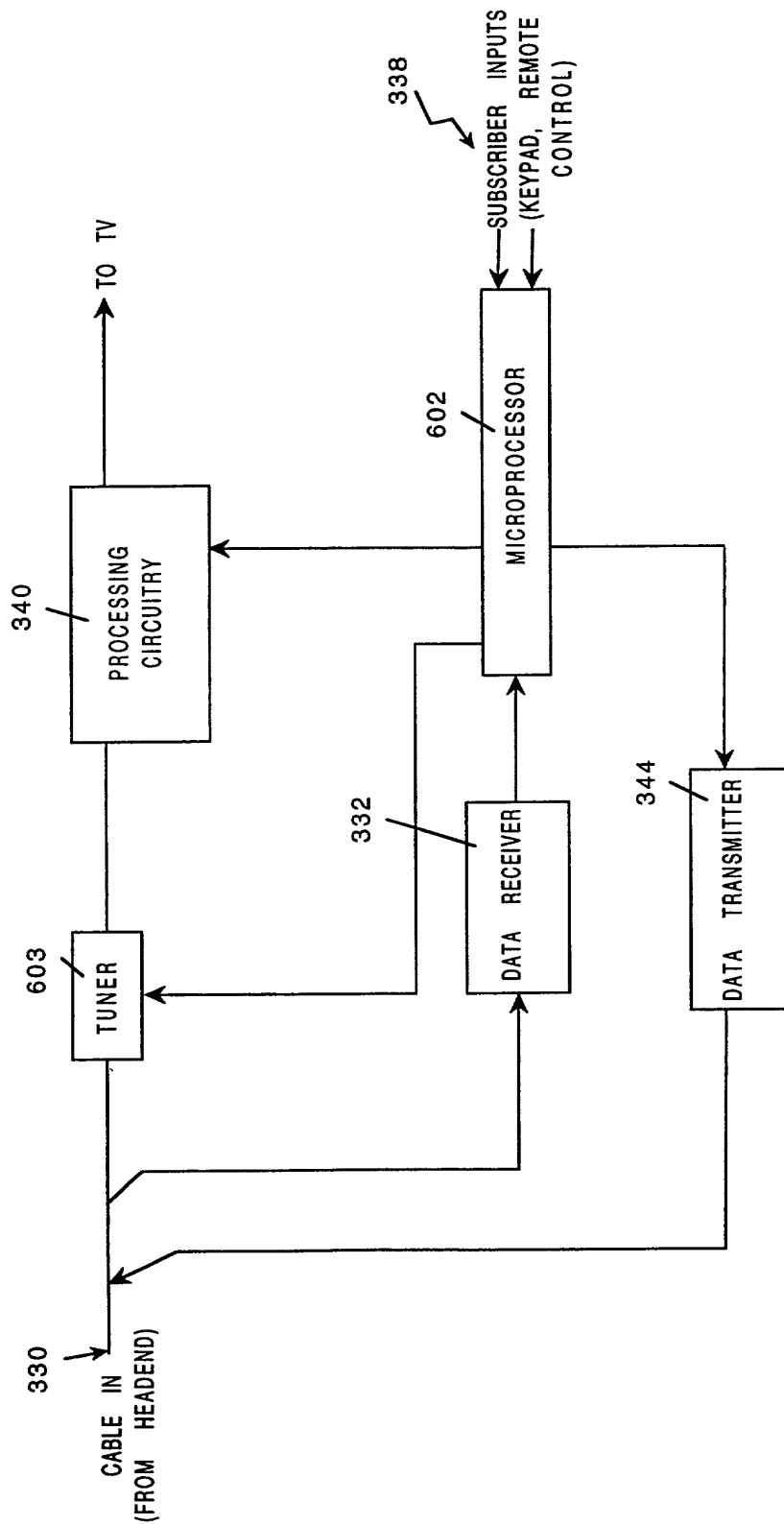


Fig. 10





SET TOP TERMINAL UPSTREAM DATA TRANSMISSION HARDWARE

Fig. 11

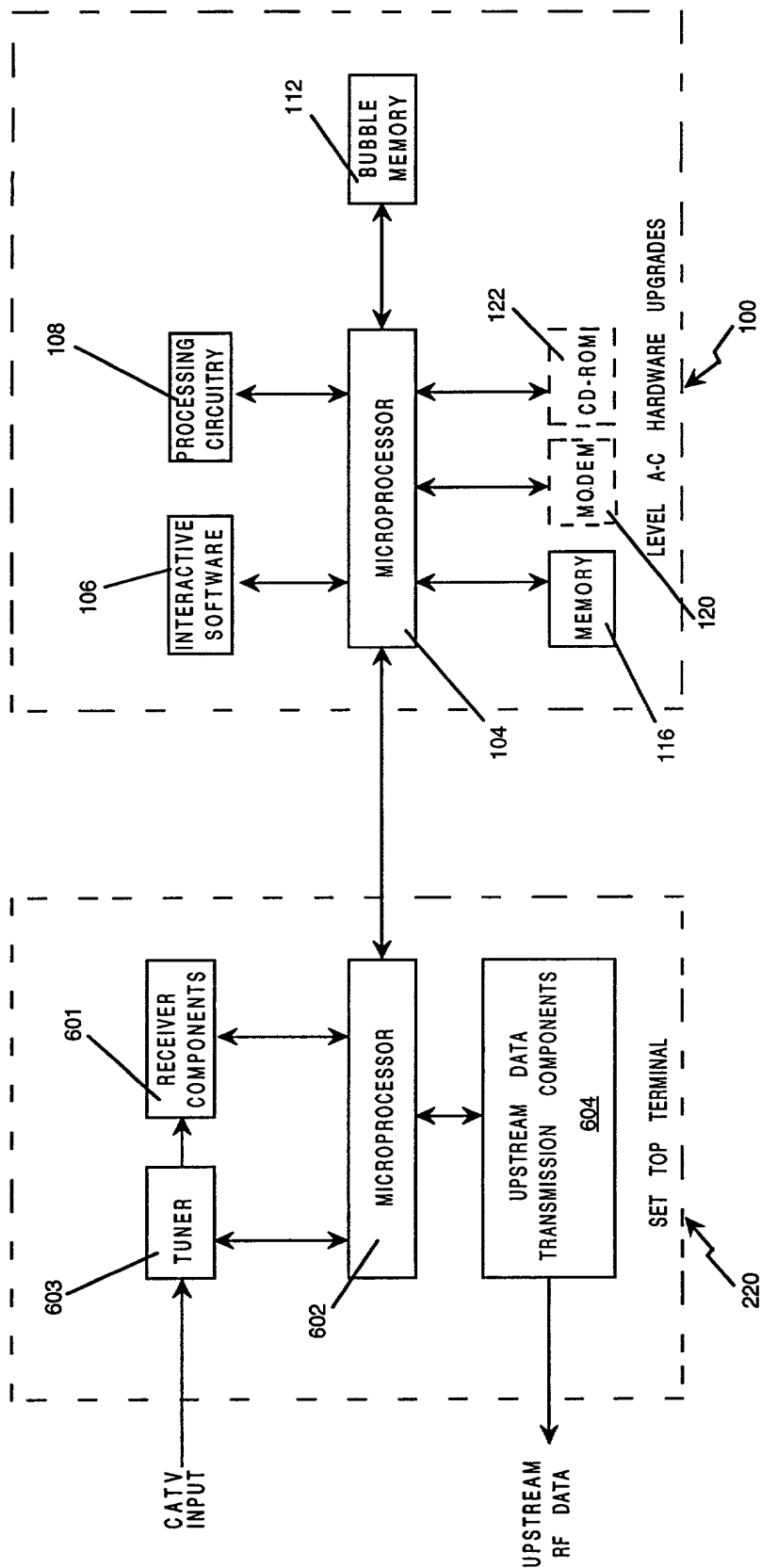


Fig. 12a

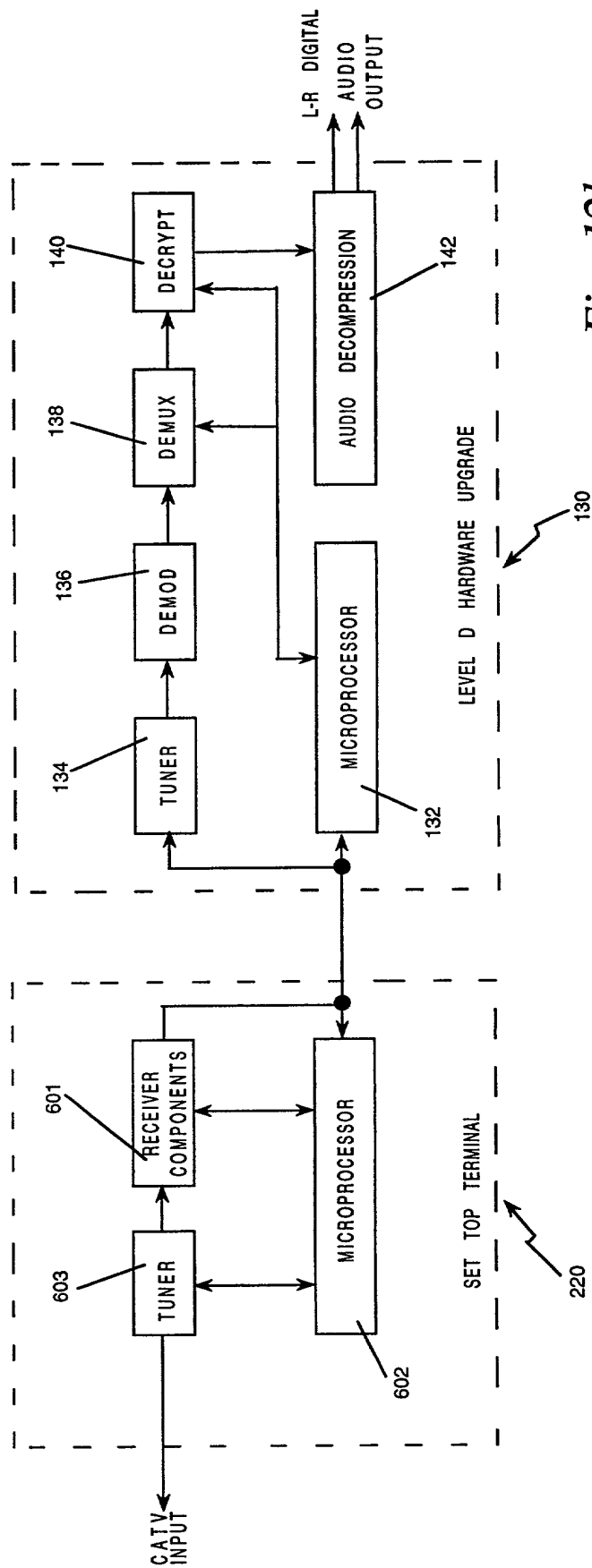


Fig. 12b

Fig. 13a

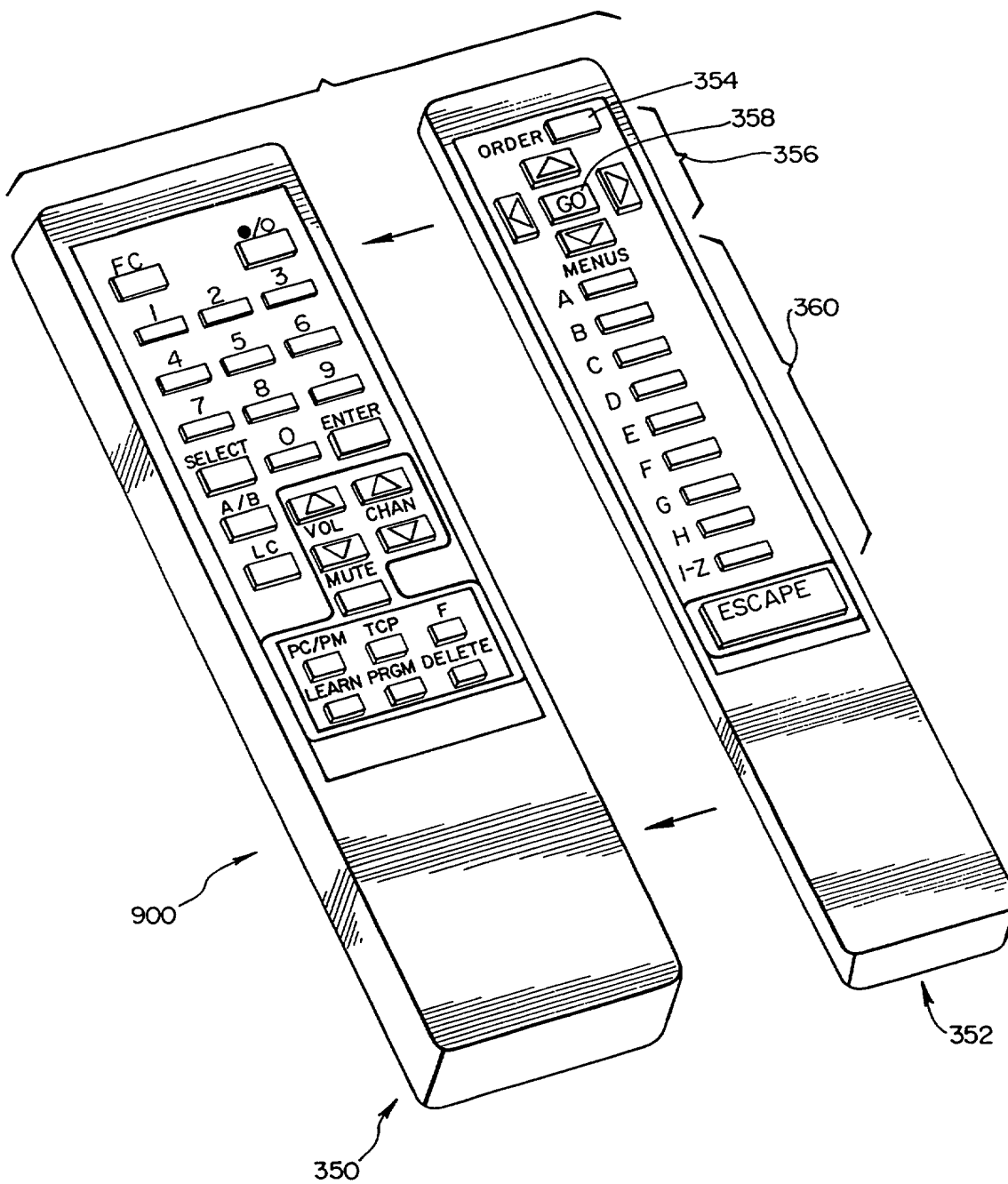
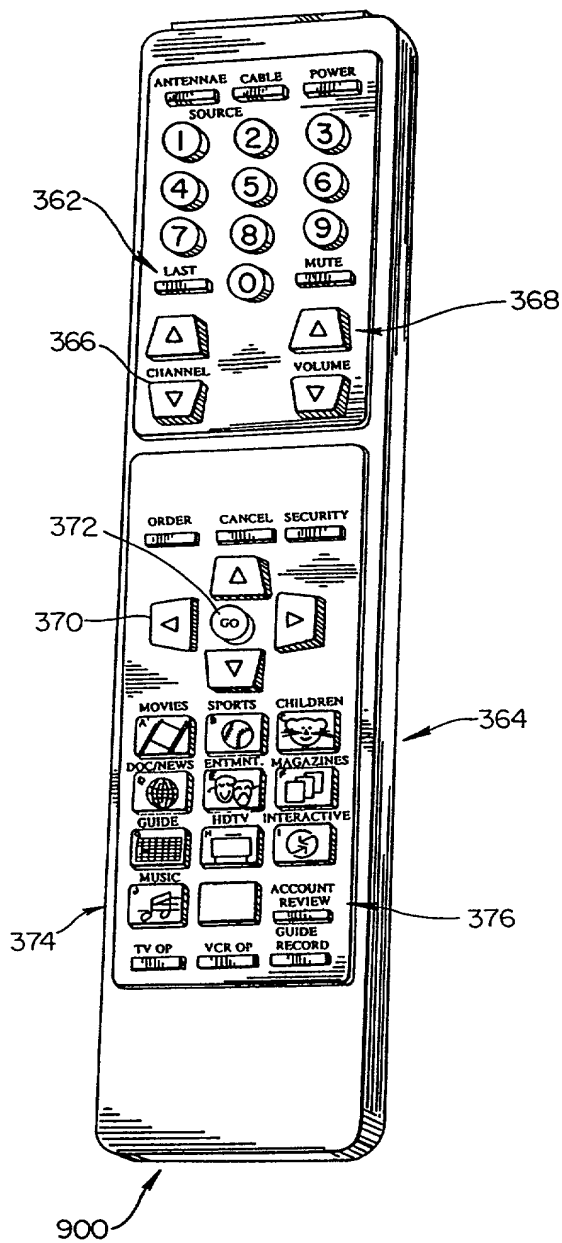


Fig. 13b



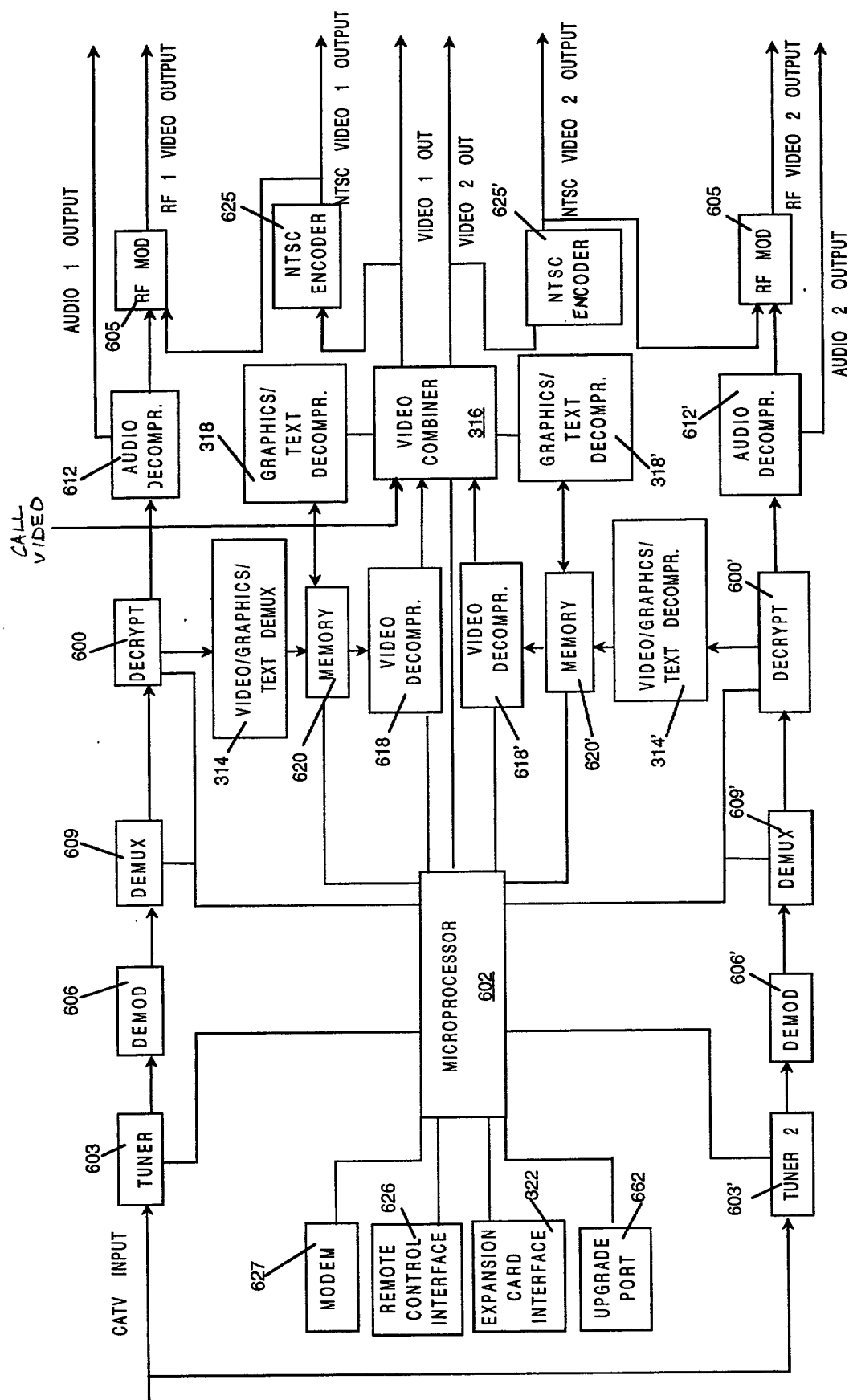


Fig. 14

Fig. 15

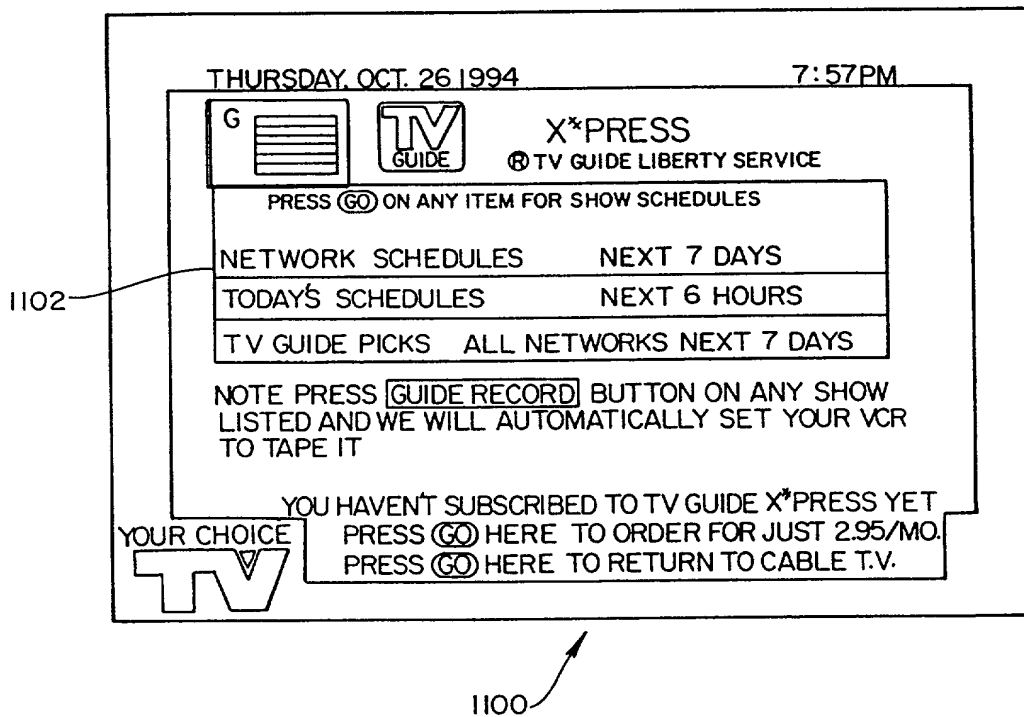
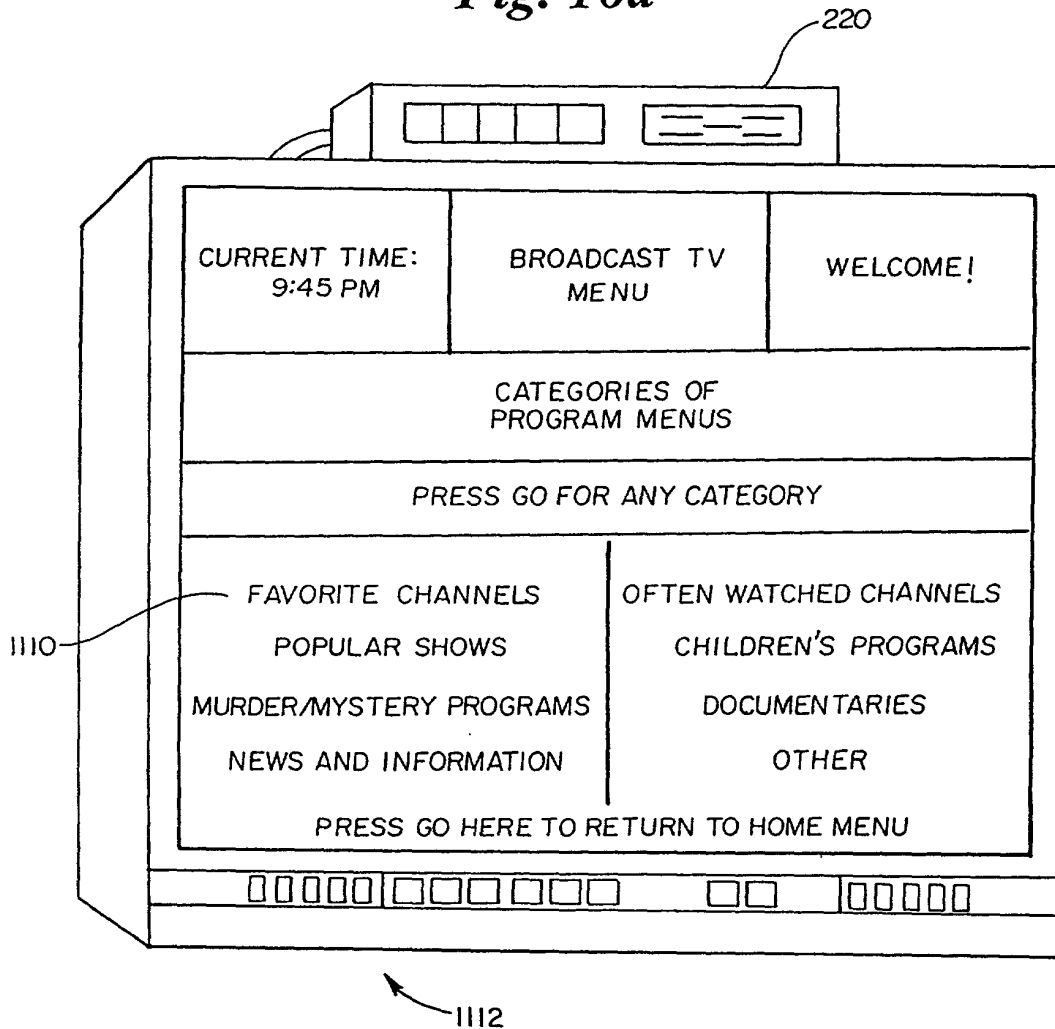


Fig. 16a



MOOD QUESTION MENUS

1114

LENGTH OF PROGRAM DESIRED

SHORT	30 minutes or less
MEDIUM	30 to 60 minutes
LONG	60 minutes or more

Fig. 16b

1116

TYPE OF PROGRAM DESIRED

SERIOUS
THOUGHTFUL
LIGHT

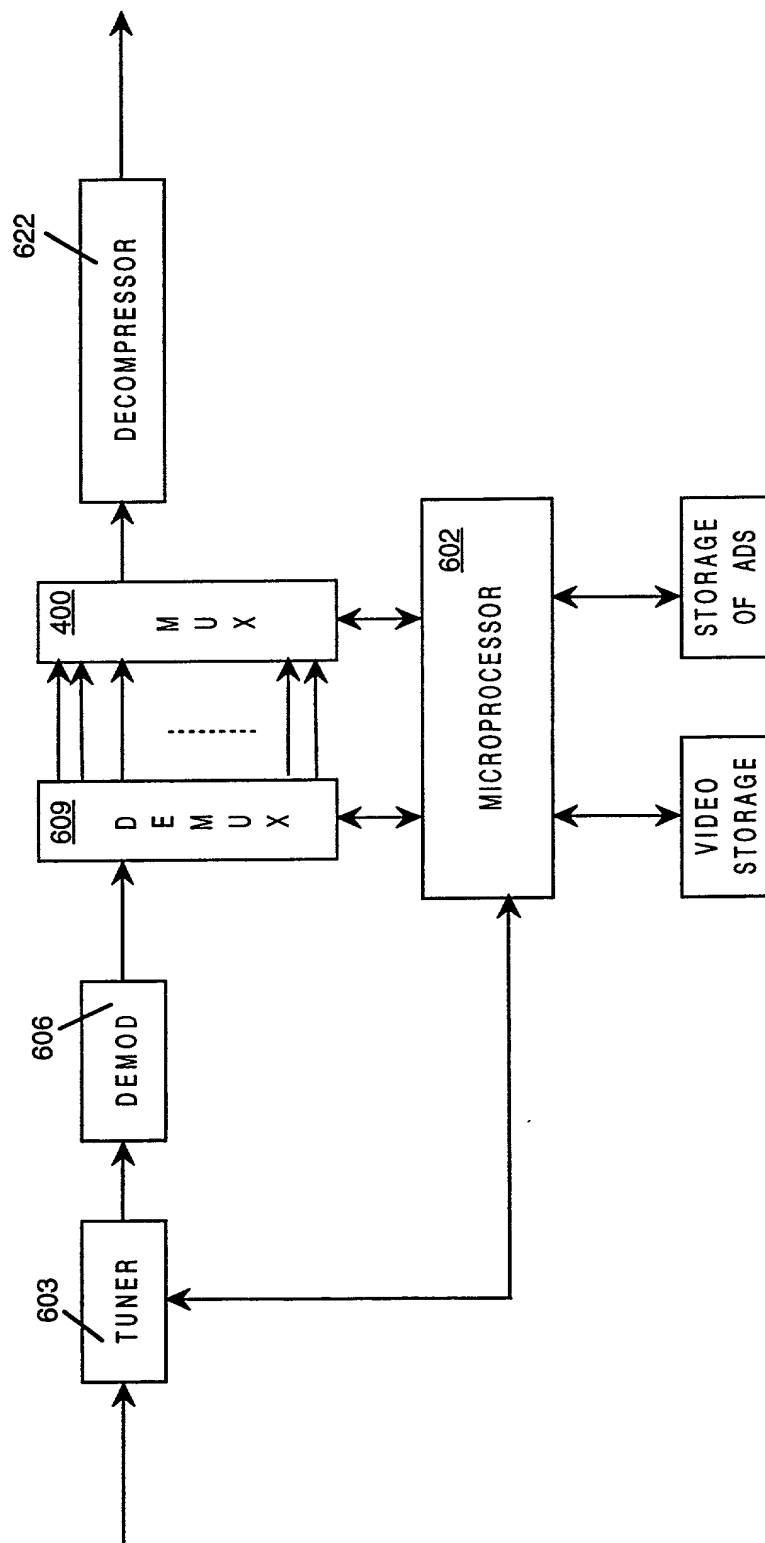
Fig. 16c

1118

DO YOU WISH AN ACTIVE OR PASSIVE PROGRAM?

ACTIVE
PASSIVE

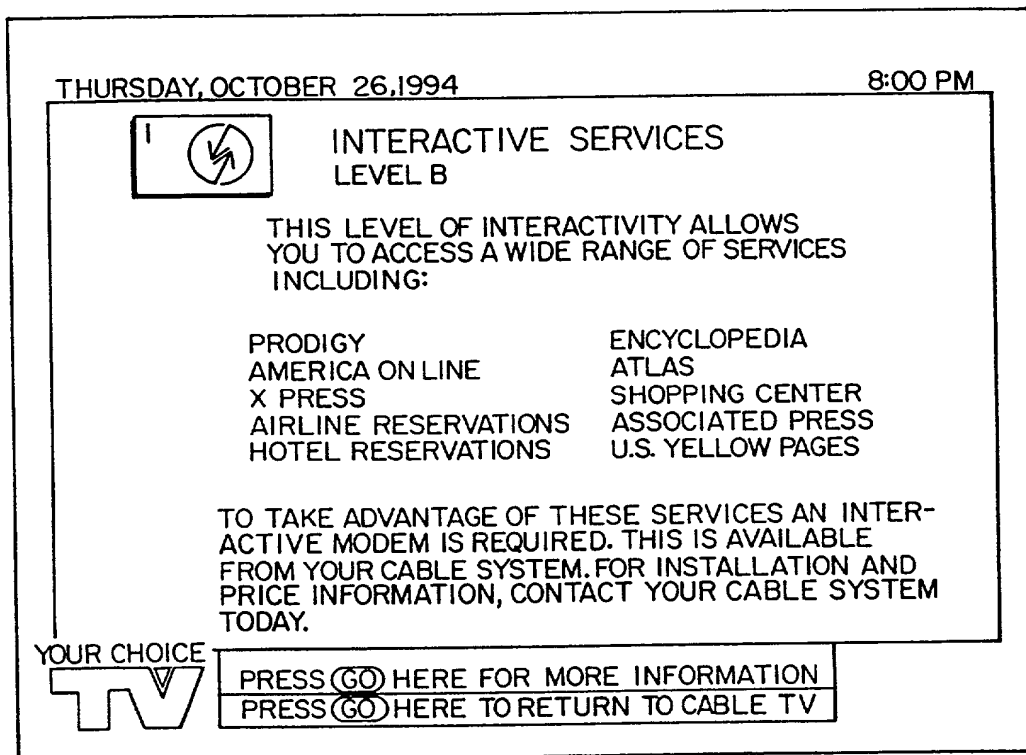
Fig. 16d



STT CHANNEL SWITCHING HARDWARE: CHANNEL SWITCHING
OUTSIDE 6MHZ BANDWIDTH

Fig. 17b

Fig. 18



1120

Fig. 19a

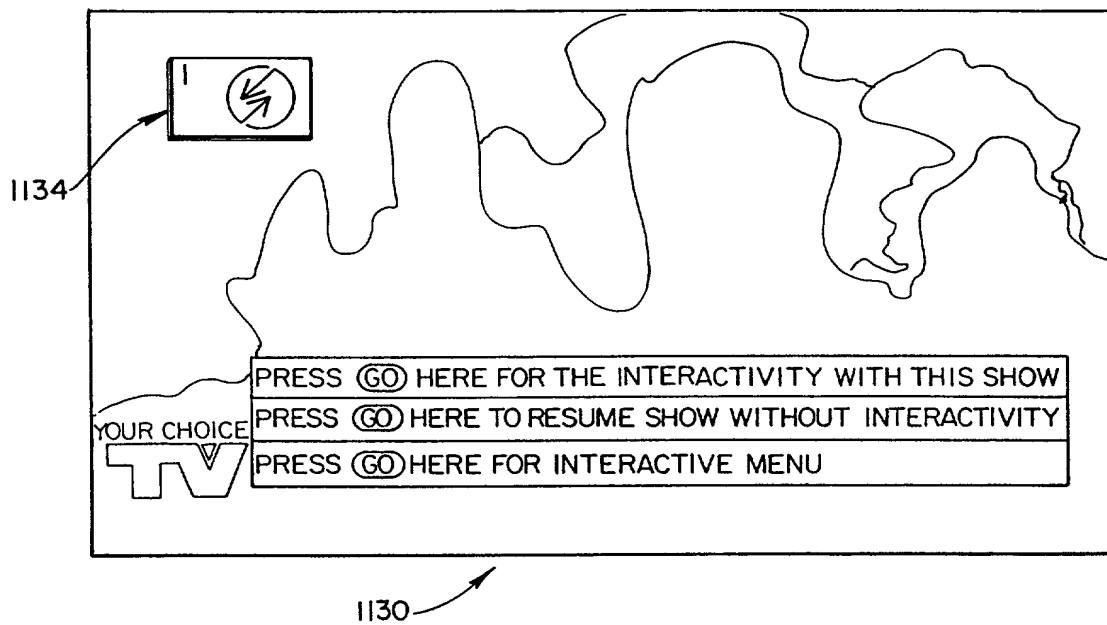


Fig. 19b

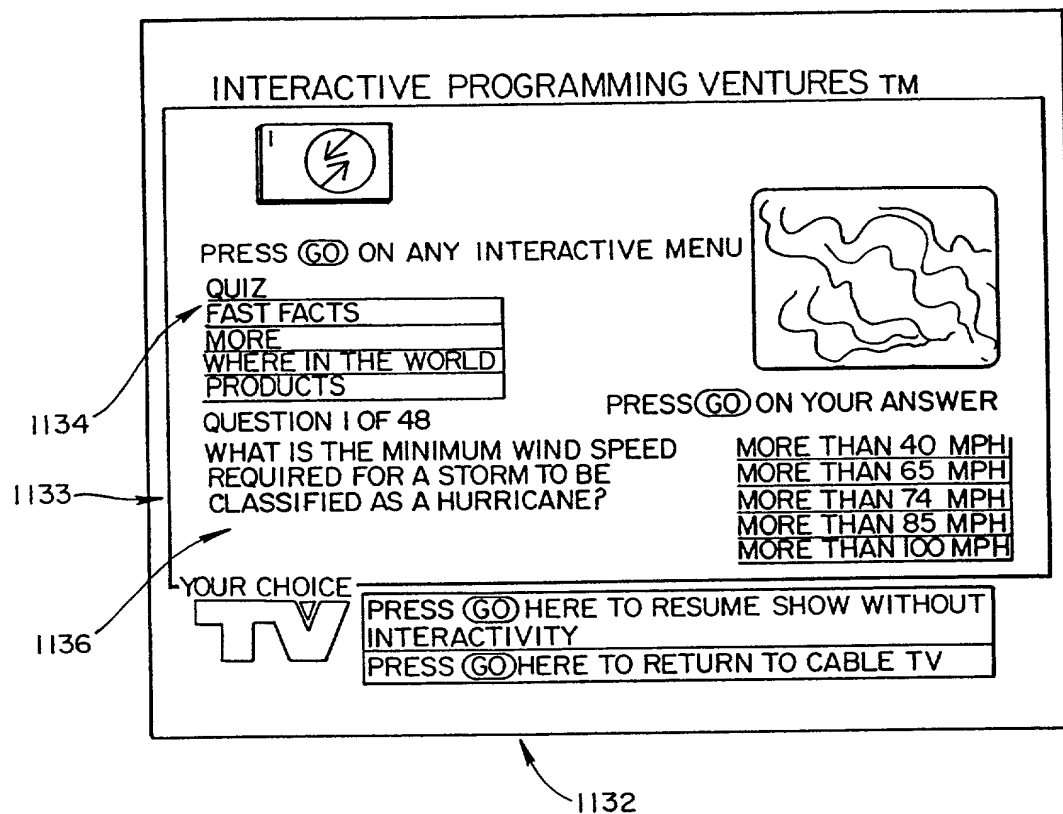
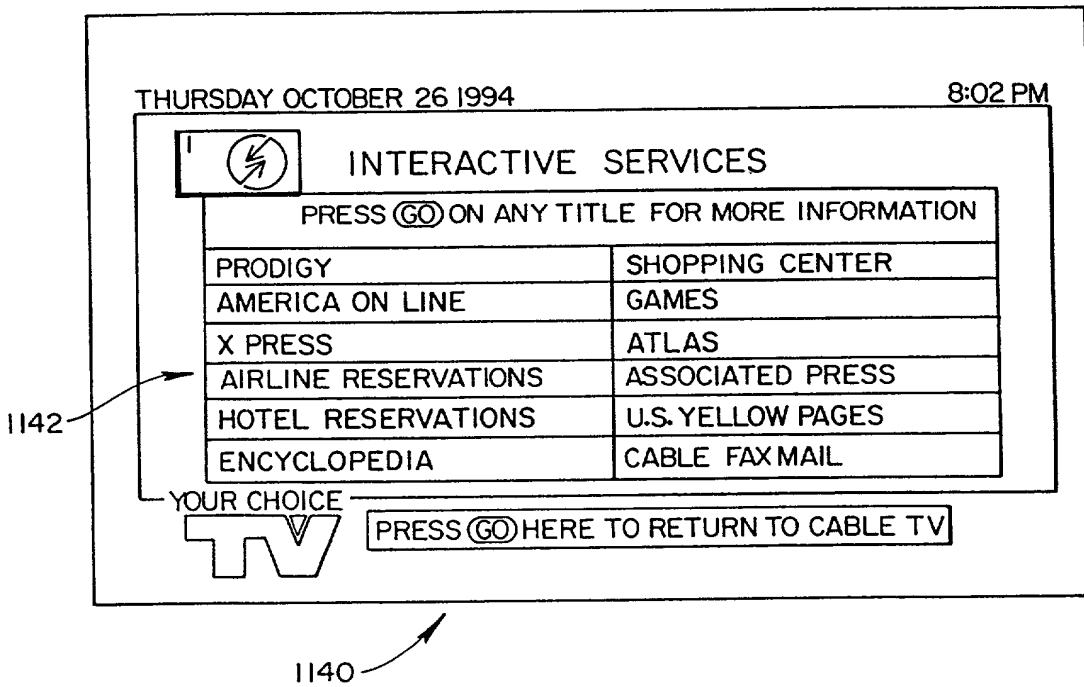
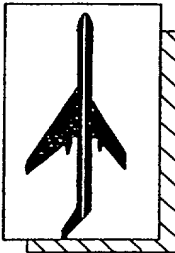


Fig. 20a



Thursday, October 26, 1994

8:04PM

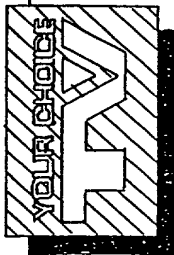


AIRLINE INFORMATION AND RESERVATIONS(continued)

Here are your airline flight options for a morning departure from Phoenix to Dulles.

Press **GO** on Any Flight to Check Availability and Fare

Depart Time	Arrive Time	Airline	Flight No.	Stops	Connecting Through
6:15AM	1:30PM	AMERICAN	32	0	
7:30AM	2:45PM	AMERICAN	212	0	
8:00AM	3:07PM	DELTA	49	0	
10:30AM	7:15PM	US AIR	285	1	Chicago
11:25AM	6:10PM	UNITED	10	0	
11:45AM	8:40PM	UNITED	77	1	Dallas



Press **GO** Here to Return to Airline Main Menu

Press **GO** Here to Return to Menu

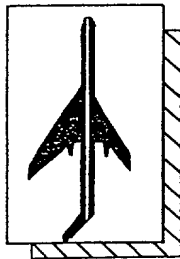
Press **GO** Here to Return to Cable TV

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FIG. 20b

Thursday, October 26, 1994

8:05PM




AIRLINE INFORMATION AND RESERVATIONS(continued)

DELTA FLIGHT #49 from Phoenix to Dulles direct
departs 8:00 AM and arrives 3:07 PM

SEATS AVAILABLE ARE SHOWN IN BLUE

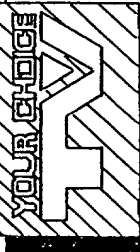
3 First Class Seats Remaining
15 Coach Class Seats Remaining


Press  on Any Blue Seat(s) to Make Reservations


First Class										Coach Class										Aircraft Equipment 757									

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YOUR CHOICE



Press  Here to Erase Above and Repeat

Press  Here to Cancel Above and Exit


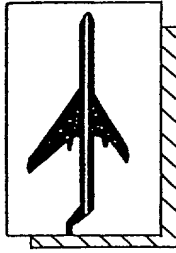
Press  Here to Continue

FIG. 20c

Thursday, October 26, 1994


8:06 PM



AIRLINE INFORMATION AND RESERVATIONS(continued)

CREDIT CARD CHARGE

Amount: \$590.00		Delta Flight # 49	
One Way: Phoenix to Dulles Date: 11/25/94			
Departs: 8:00 AM Arrives: 3:07 PM Dinner			
American Express	Visa	Discover	Master Charge

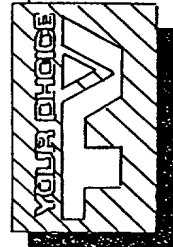
Press  on
Credit Card You
Want to Use:




Enter Your Credit Card Number:

2	1	7	7	7	3	5											
---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--

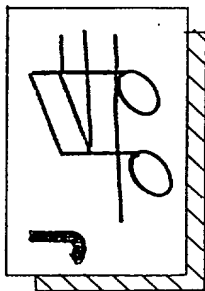
Enter Expiration Date (example 09/91/97):

Month:		Year:	
0	9	9	7



Press  Here to Erase Above and Repeat
Press  Here to Cancel Above and Exit
Press  Here to Confirm Above Charge


8:08 PM



DMX Demonstration



Here are the menu options you'll enjoy:


Press  On the station you want

Top 5	Hard Rock	Easy Listening	New Age	Country Top 40	Rhythm and Blues	Classical
Top 10	Heavy Metal	Instrumentals	Favorite Light Rock	New Country	Blues Legends	Classical Piano
Top 40	Rock Classics	Easy List. Favorites	Beatles Only	Country Classics	Soul	Classical Strings
Rock	Rap	Jazz	Rock Legends	Bluegrass	Soul Classics	Classical Guitar
'30s	'40s	'50s	'60s	'70s	'80s	'90s
Waltz	Latin	Disco	Polka	Reggae	Dance Fever	Teen Dance

You are Listening to:
MAGGIE MAY by Rod Stewart 1972

More Information on Current Artist/Song

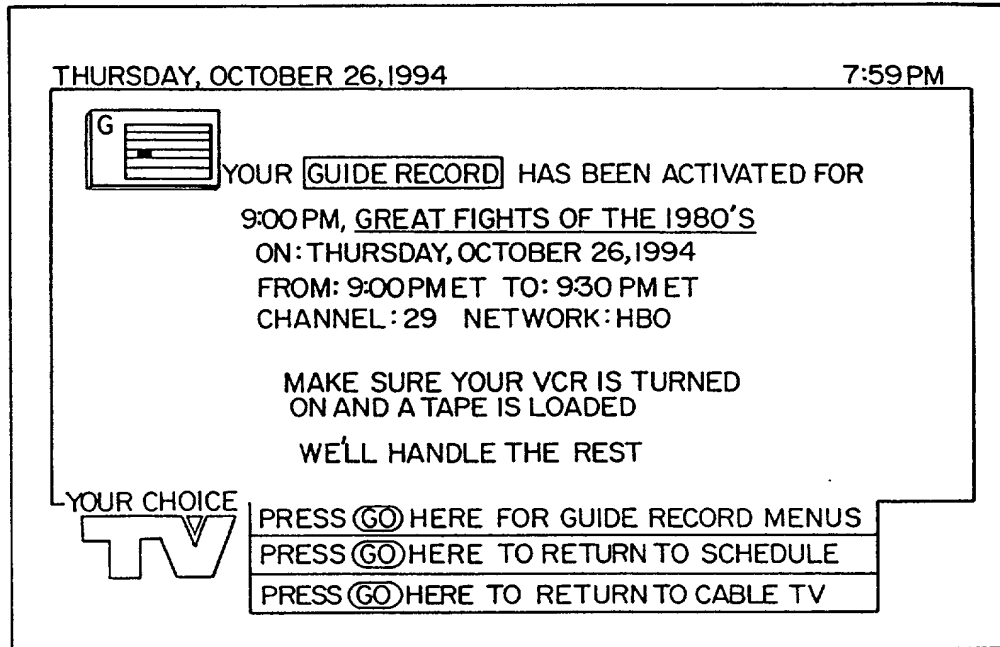
All this for just \$4.95 per month. Less than 1/2 the cost of one CD! ORDER NOW.

Press  Here to Order DMX

Press  Here to Return to Cable TV

FIG. 21

Fig. 22



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Fig. 23

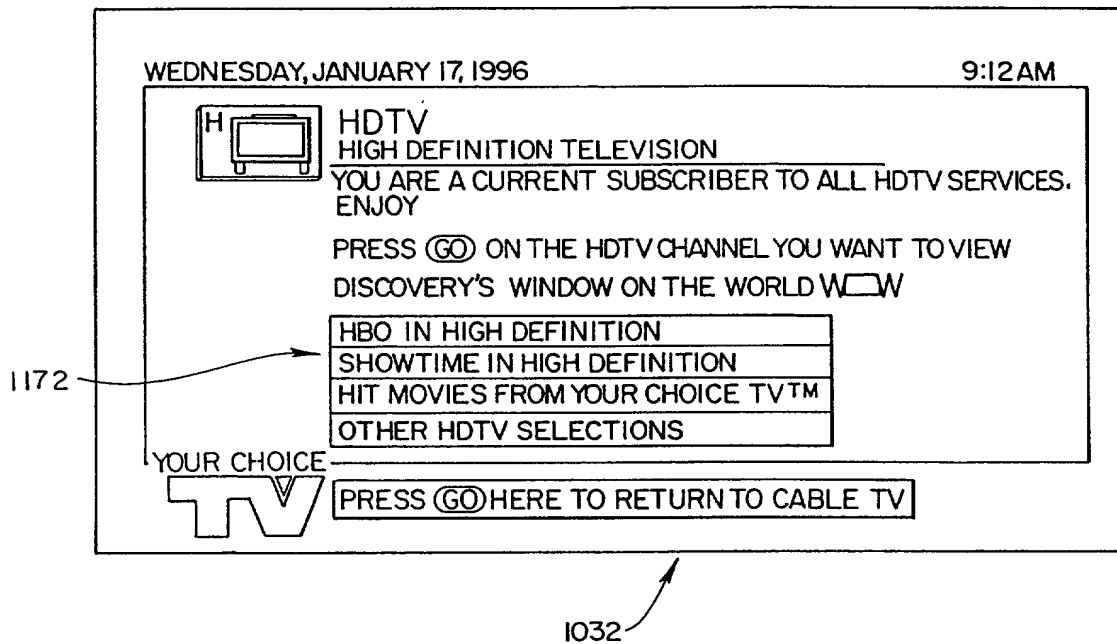




Fig. 24a

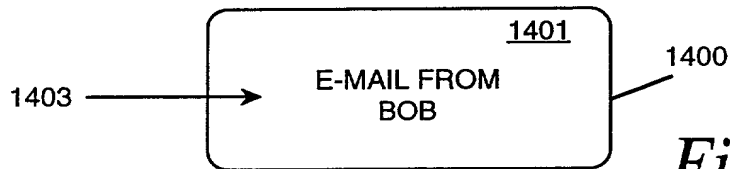


Fig. 24b

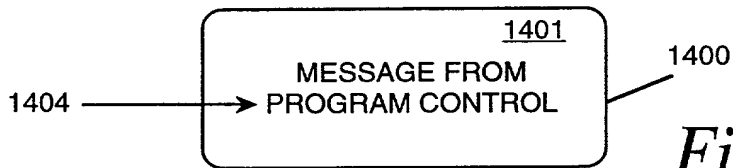


Fig. 24c

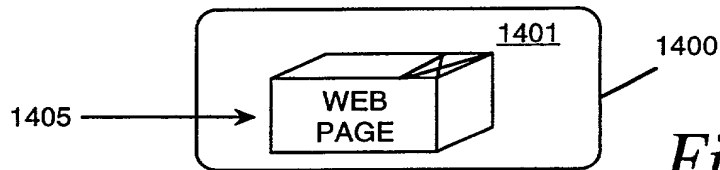


Fig. 24d

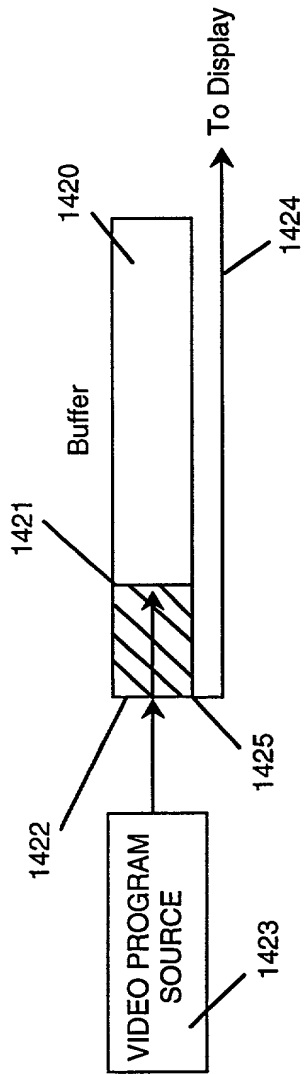


Fig. 25

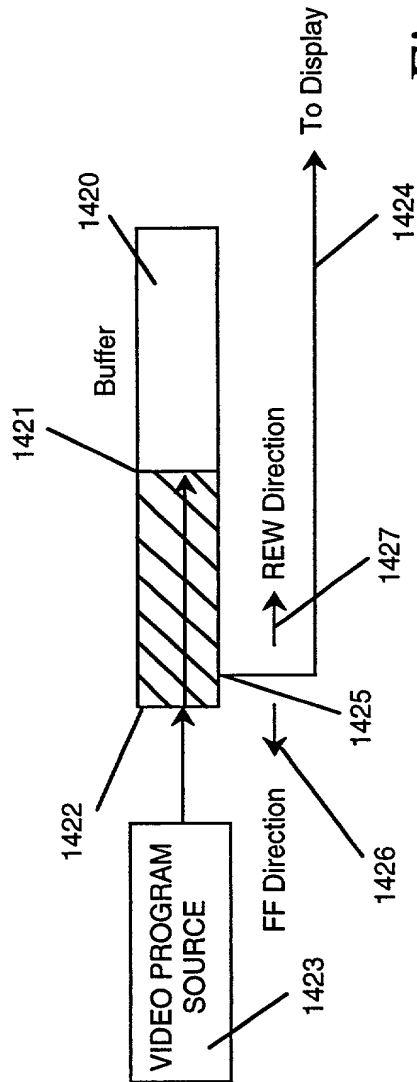


Fig. 26

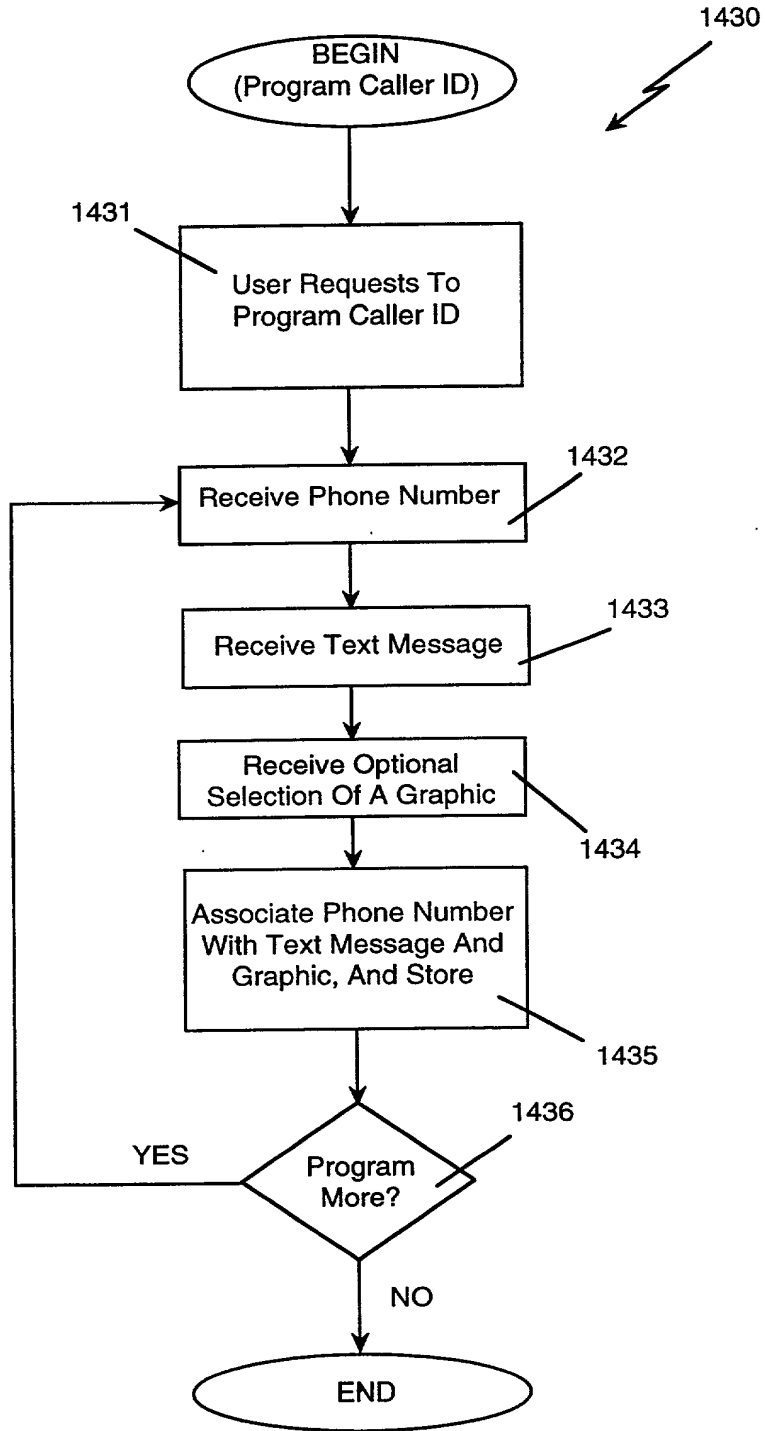


Fig. 27

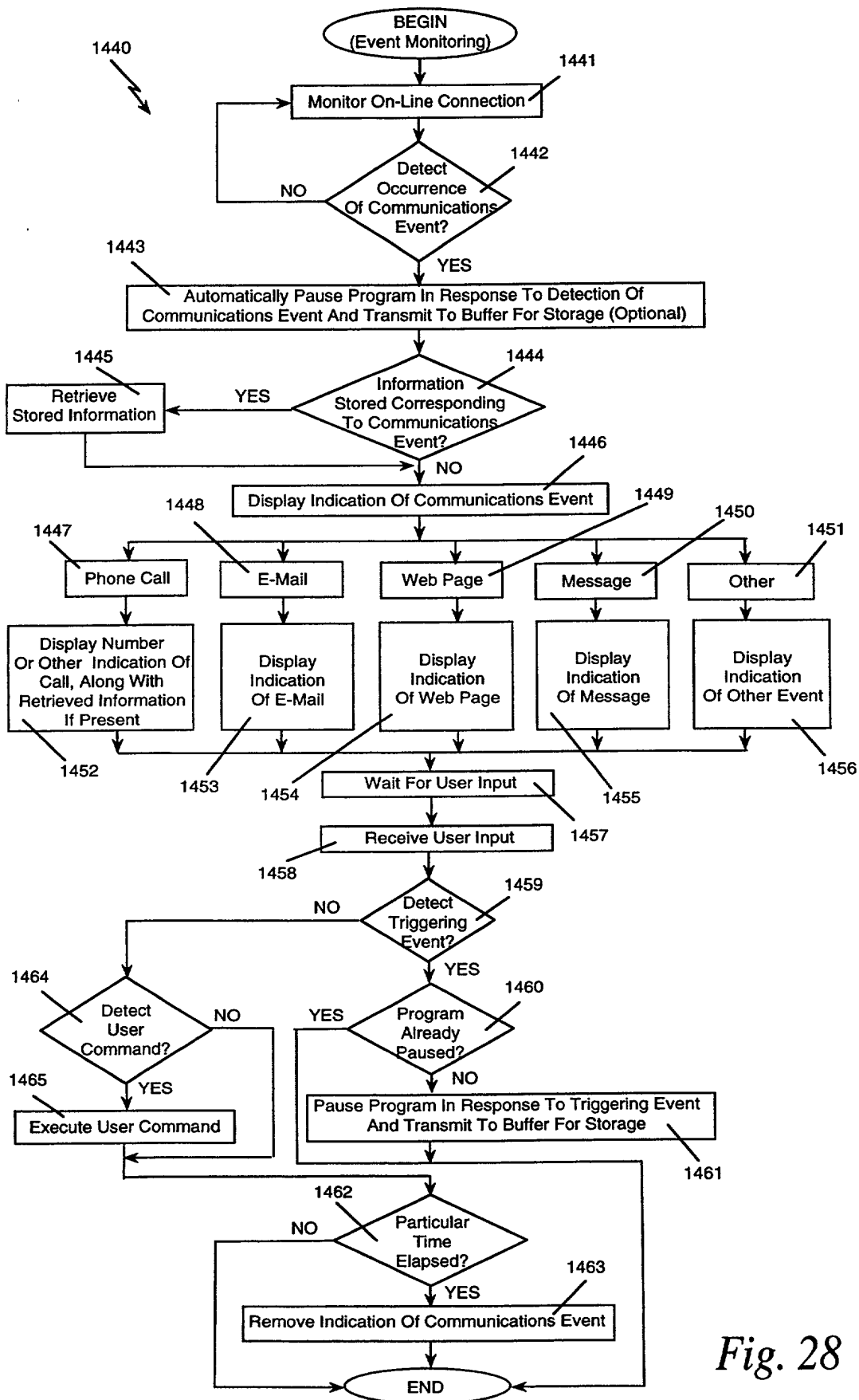
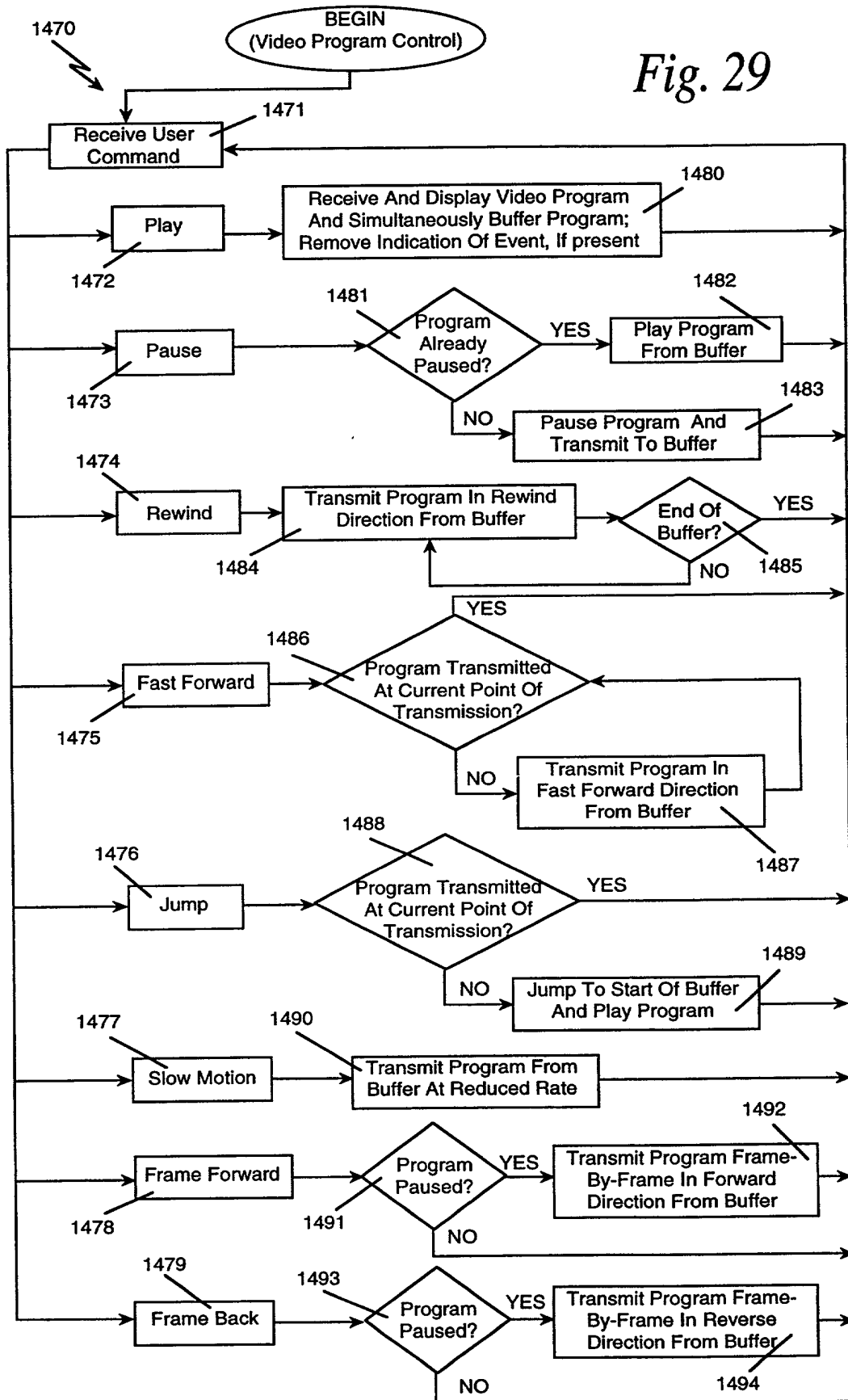


Fig. 28

Fig. 29



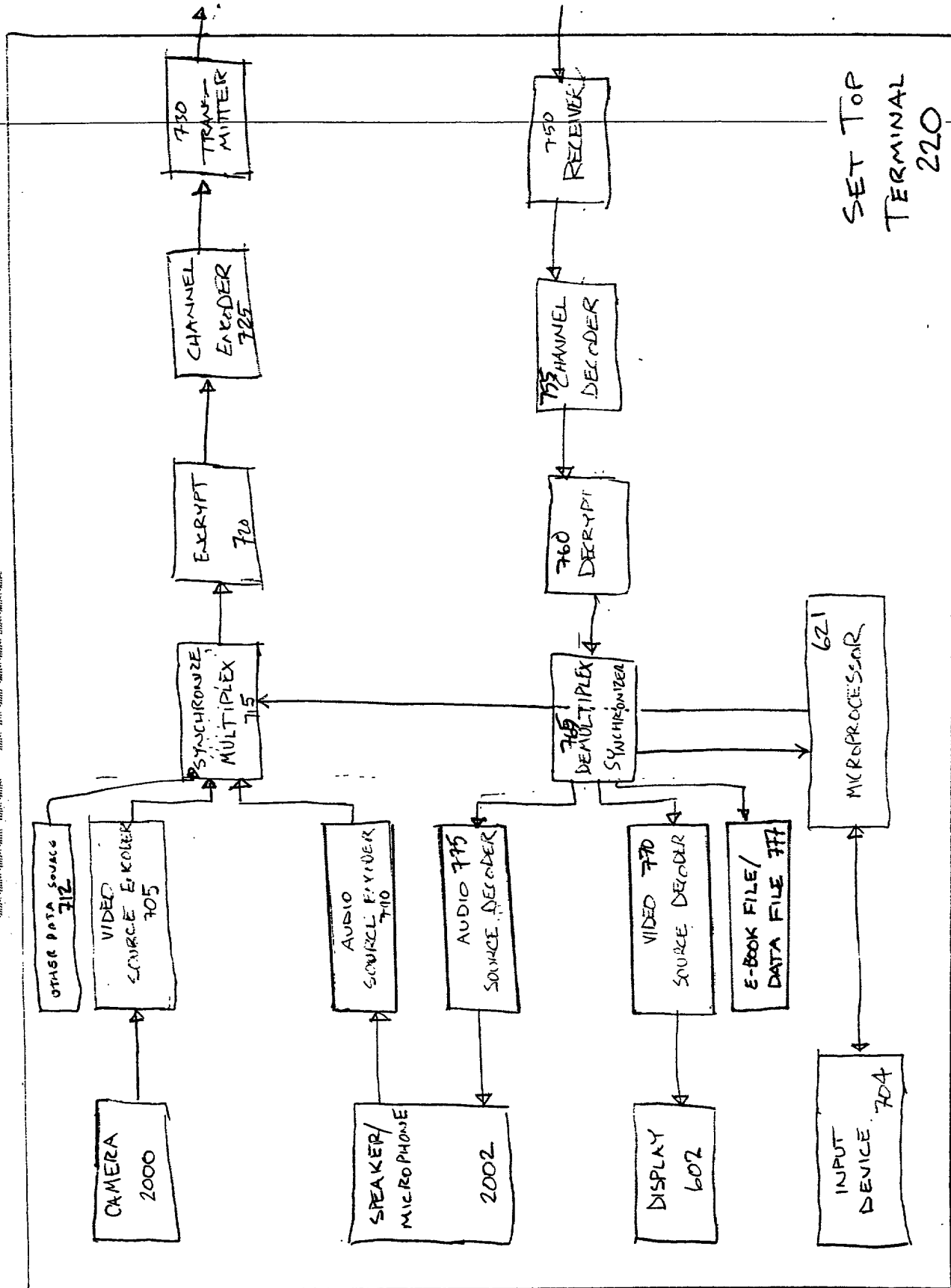


Fig. 30

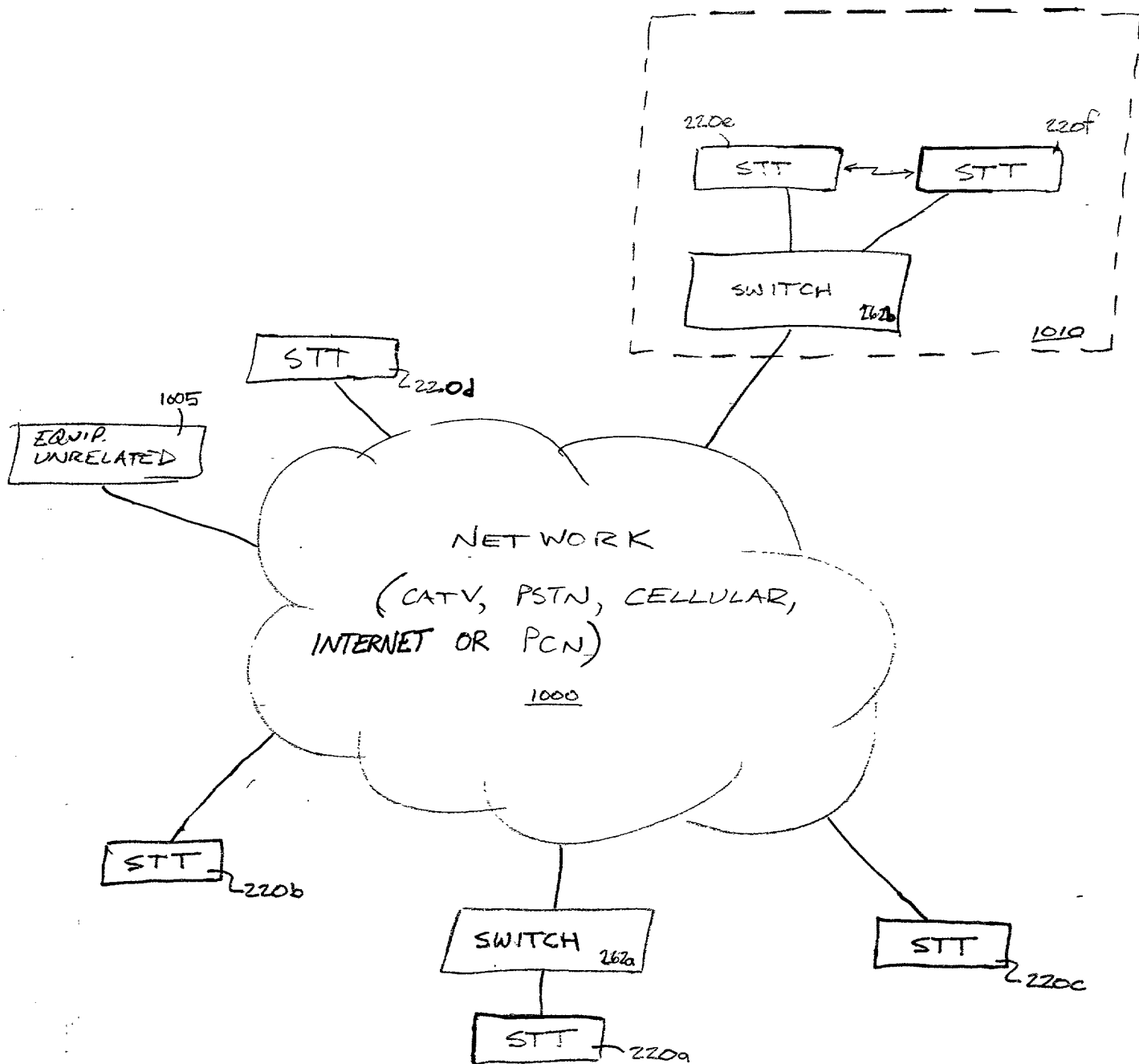


Fig. 31

STT
220e

STT
220f

STT
220g

1010

The diagram illustrates a network topology. A central box labeled "SWITCH 262c" is connected to three other boxes: "STT 220e" (top left), "STT 220f" (top right), and "STT 220g" (bottom). The connections are labeled with reference numerals: 1200 for the link to STT 220e, 1205 for the link to STT 220f, and 1210 for the link to STT 220g. All connections are bidirectional, indicated by arrows pointing in both directions. The entire diagram is labeled with the reference numeral 1010.

F. 9. 33

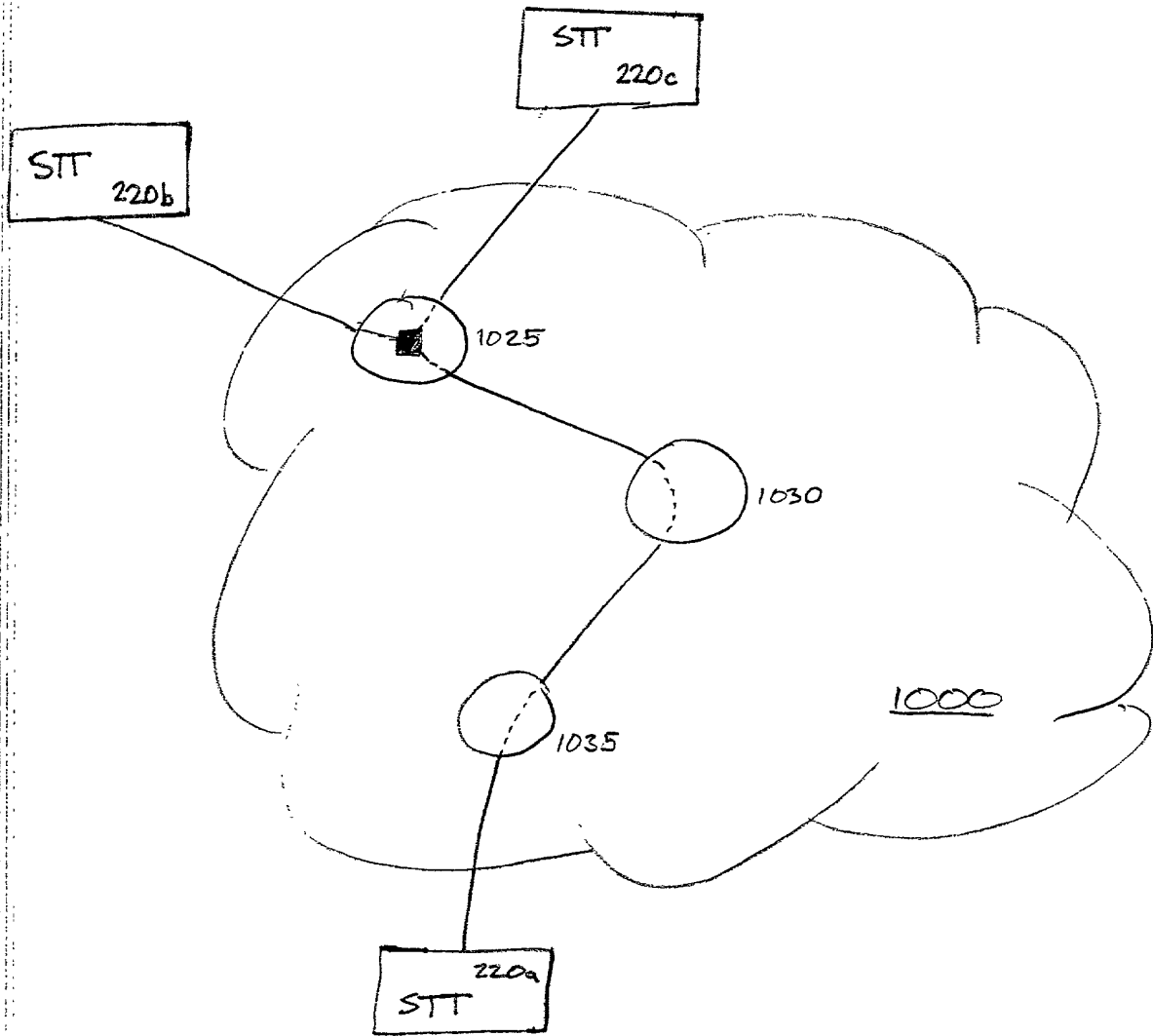
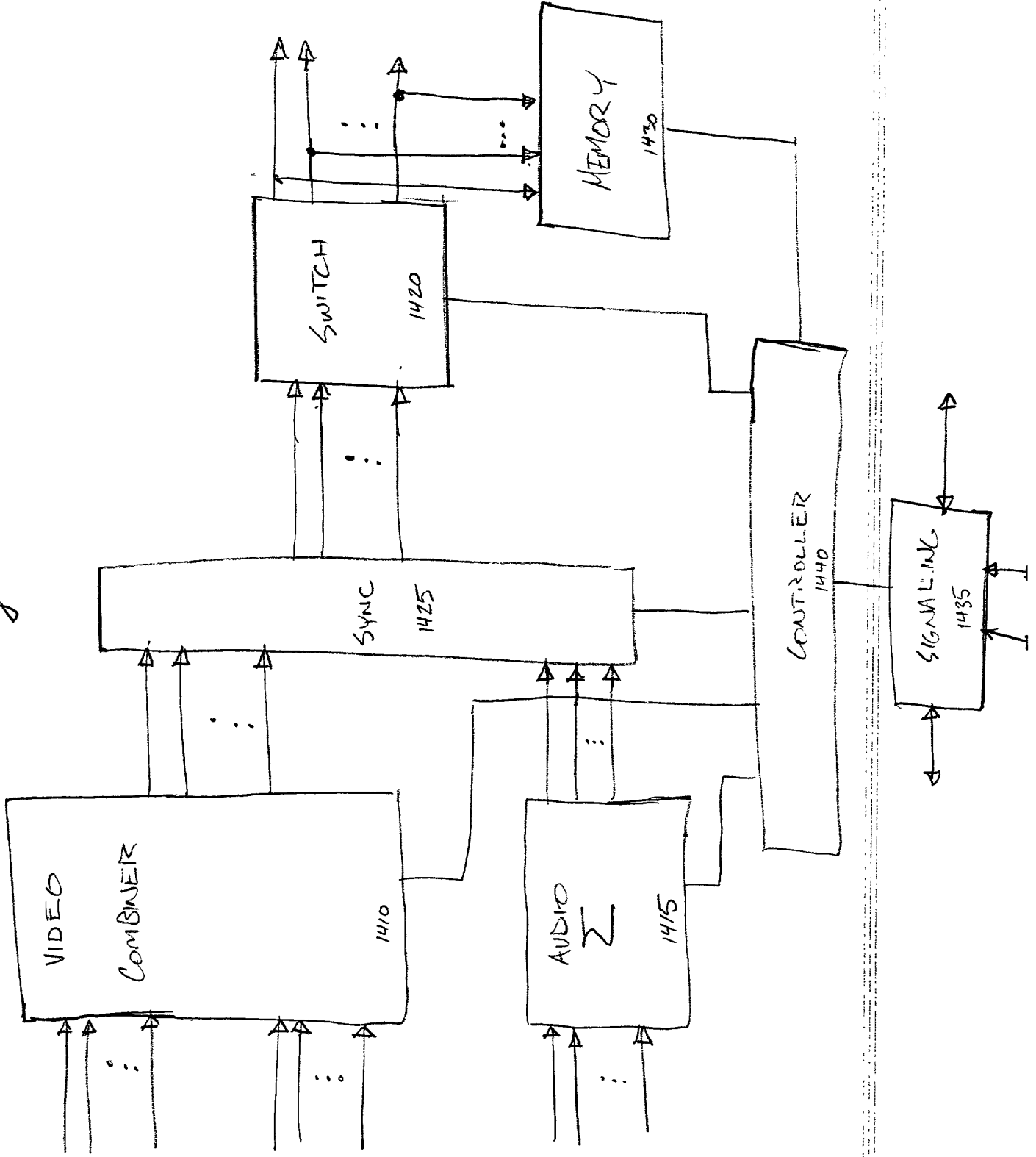


Fig. 34

Fig. 35



Docket No.

5216

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ADVANCED SET TOP TERMINAL HAVING A VIDEO CALL FEATURE

the specification of which

(check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. or PCT International

Application Number _____

and was amended on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

(Number)

(Country)

(Day/Month/Year Filed)

☐

(Number)

(Country)

(Day/Month/Year Filed)

☐

(Number)

(Country)

(Day/Month/Year Filed)

☐

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

Aldo Noto, Reg. No. 35,628

John K. Harrop, Reg. No. 41,817

John W. Ryan, Reg. No. 33,771

W. Robinson H. Clark, Reg. No. 41,530

Ami P. Shah, Reg. No. 41,143

Sean S. Wooden, Reg. No. 43,997

Christopher McWhinney, Reg. No. 42,875

Matthew Phillips, Reg. No. 43,403

Lance Vietzke, Reg. No. 36,708

Send Correspondence to: **Lance Vietzke, Reg. No. 36,708**
DORSEY & WHITNEY LLP
1001 Pennsylvania Avenue N.W., Suite 300 South
Washington, D.C. 20004

Direct Telephone Calls to: *(name and telephone number)*
Lance Vietzke, Reg. No. 36,708 (202)824-8839

Full name of sole or first inventor Michael L. Asmussen	
Sole or first inventor's signature	Date
Residence 2627 Meadow Hall Drive, Oak Hill, VA 20171	
Citizenship United States	
Post Office Address 2627 Meadow Hall Drive, Oak Hill, VA 20171	

Full name of second inventor, if any	
Second inventor's signature	Date
Residence	
Citizenship	
Post Office Address	